Sizewell C

Proposed Nuclear Development

Stage 3 Pre-Application Consultation

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2B

Volume 2B

Preliminary Environmental Information

EDF ENERGY SZC CGN

Contents

Sizewell C | Proposed Nuclear Development

Volume 2B Preliminary Environmental Information

7. Two Village Bypass PEI

7.1. Introduction to PEI

7.1.1. The route of the two village bypass would bypass the villages of Farnham and Stratford St Andrew with a new single carriageway road to the south (see **Volume 1 Figure 2.12**). Once operational, the bypass would form a new section of the A12.

7.1.2. The proposed route runs approximately 2.4 kilometres (km) across predominantly agricultural land to the south of the existing A12, departing the A12 to the west of Stratford St Andrew via a new three arm roundabout near Parkgate Farm. It would bend south around Nuttery Belt and continue around Pond Wood and Foxburrow Wood, then continue north crossing local roads and a couple of Public Rights of Way (PRoWs), before re-joining the A12 with a second roundabout to the east of Farnham at the A12/A1094 Friday Street junction. The scheme proposed is described in further detail in **Volume 1**, **Chapter 12.**

7.1.3. The road would be 7.3 metres (m) wide with 1m hardstrips, 2.5m wide verges, earthworks where needed and a 5m berm. EDF Energy is consulting on a wider area during this Stage 3 consultation including the buffer zone shown on **Volume 1**, **Figure 2.12,** as the design and landscaping mitigation has yet to be fully finalised, and in particular EDF Energy would wish to engage with land owners in relation to works which might accommodate the access works for their retained land.

7.1.4. The two village bypass would be open to public use alongside construction traffic associated with the project. After completion of the power station, it would be retained as a lasting legacy of the project. There would be no decommissioning or 'removal and reinstatement' phase.

7.1.5. The preferred proposals are likely to have some effects on the environment during construction and operation. The likely significant adverse and beneficial effects for the construction and operational phases are explained below. The scope of the preliminary assessment includes landscape and visual, terrestrial ecology and ornithology, amenity and recreation, geology and soils, land quality and agriculture, terrestrial historic environment, noise and vibration, air quality, groundwater, surface water, flood risk, and traffic and transport and no topics have been 'scoped out' of the assessment. The chapter concludes with a short comparison between the road-led and rail-led strategies as relevant to the two village bypass.

7.1.6. This chapter presents each of the topics relevant to the site in turn, under the following sub-headings: (a) Baseline Environment, (b) Environmental Design and Embedded Mitigation, (c) Preliminary Assessment of Effects, (d) Additional Mitigation and Monitoring, (e) Preliminary Assessment of Residual Effects and (f) Completing the Assessment.

7.2. Landscape and visual

7.2.1. The figure for landscape and visual is presented in **Volume 3** as **Figure 7.2.1.**

a) Baseline environment

7.2.2. The proposed bypass route would be approximately 2.4km long and cover an area of approximately 61.1 hectares (ha). It would slope down from its western end where it would leave the A12 at a new roundabout, to a low point in the Alde valley. It would cross the River Alde on a bridge, before beginning to cut into the landscape and rising to a high point south-east of Farnham Hall. At the eastern end of the route, the bypass would tie back into the A12 at another new roundabout.

7.2.3. The land use within the study area is predominantly arable farmland, with well-defined hedgerow field boundaries and interspersed with scattered woodlands and copses. However, the valley of the River Alde is predominantly pastoral with less hedgerows and more drainage ditches as field boundaries. The route would be largely at grade, within shallow cuttings or on low embankments, except for the elevated section over the valley of the River Alde.

7.2.4. The proposed bypass would cross predominately arable fields, with some pasture in the Alde valley, cutting across existing hedgerow field boundaries, local roads and public footpaths. There are also some areas of existing woodland within the red line boundary for the proposed route.

7.2.5. At a national level, the site and much of the study area are situated within National Character Area 82 (NCA82): South Coast and Heaths (Ref. 7.2.1). NCA82 comprises low-lying gently undulating farmland with areas of woodland, heath and forest plantation. The valley of the River Alde is typical of the transition between this character area and the adjacent NCA83: South Norfolk and High Suffolk Claylands to the west. NCA83 is a predominantly flat clay plateau incised by numerous small-scale wooded river valleys.

7.2.6. At a local level, the site is predominantly located in the 'rolling estate sandlands' landscape character type as identified in the Suffolk County Landscape Character Assessment (Ref. 7.2.2) and shown on **Figure 7.2.1**. The key characteristics are described in the Landscape Character Assessment as:

- *"Rolling river terraces and coastal slopes;*
- *Sandy and free draining soils with areas of heathland;*
- *Late enclosure with a pattern of tree belts and straight hedges;*
- *Landscape parklands;*
- *A focus of settlement in the Estate Sandlands landscape;*
- *19thC red brick buildings with black glazed pantiles in the east;*
- *Lark valley buildings are frequently of brick or flint with tiled or slate roofs;*
- *Tree belts and plantations throughout;*
- *Occasional and significant semi-natural woodlands and ribbons of wet woodland; and*
- *Complex and intimate landscape on valley sides".*

7.2.7. The valley of the River Alde, as shown on **Figure 7.2.1,** is characterised as the 'valley meadowlands' landscape character type. The key characteristics are described in the Landscape Character Assessment as:

- *"Flat landscapes of alluvium or peat on valley floors;*
- *Grassland divided by a network of wet ditches;*
- *Occasional Carr woodland and plantations of poplar;*
- *Occasional small reedbeds;*
- *Unsettled;*
- *Cattle grazed fields; and*
- *Fields converted to arable production".*

7.2.8. A small section of the site to the west, shown on **Figure 7.2.1,** can be characterised as the 'rolling estate claylands' landscape character type. This is a valley side landscape of clay loams with parklands and fragmented woodland. The key characteristics are described in the Landscape Character Assessment as:

- *"Flat landscape of light loams and sandy soils;*
- *Rolling valley-side landscape;*
- *Medium clay and loamy soils;*
- *Organic pattern of fields;*
- *Occasional areas of more rational planned fields;*
- *Numerous landscape parks;*

- *Substantial villages;*
- *Fragmented woodland cover, both ancient and plantation; and*
- *Winding hedged and occasionally sunken lanes".*

7.2.9. The locations of different groups of people within the 2km study area (judged to be appropriate to cover all potentially material impacts during construction and operation) who may experience views of the proposed development are shown on **Figure 7.2.1.** The key visual receptors within the study area include the following:

- The settlements of Stratford St Andrew, Farnham, Benhall Green and Little Glemham.
- Transport routes including the existing A12 to the east and west, and the A1094 at the eastern end of the proposed route.
- Recreational routes including four footpaths crossing the proposed route (E-243/001/0, E-243/003/0, E-243/004/0 and E-243/006/0 as discussed in **Section 7.4** of this chapter on amenity and recreation); further footpaths east and west of the proposed route towards its eastern end; and Sustrans Regional Cycle Route (41/42) and Suffolk Coastal Cycle Route following the same alignment, running in a north south direction along existing minor roads at the western end of the route.
- Dispersed farmsteads along the route, with the closest residential properties being at Friday Street Farm to the north-east; Mollett's Farm to the north-west; Farnham Hall, Pond Barn Cottages and Hill Farm to the south of Farnham; and Parkgate Farm and properties along the A12 at the western and of the route.

7.2.10. Visibility of the proposed development from many of these locations is likely to be limited due to a combination of landform, woodland and established hedgerows. In most cases, visibility is likely to be limited to less than 500m due to the presence of these existing intervening features, particularly around Farnham Hall, to the south-east of Farnham, where woodland cover is high. Along the valley of the River Alde, visibility of the proposed embankments and new bridge could extend to intermittently up to approximately 1.2km to the south and approximately 750m to the north.

7.2.11. The Suffolk Coasts and Heaths Area of Outstanding Natural Beauty (AONB) is located approximately 2.5km to the south-east of the eastern end of the proposed route.

7.2.12. The western end of the route falls within a locally designated landscape that covers the River Alde valley. This wraps around to the north of Farnham, immediately adjacent to the eastern end of the proposed route, as well as along the valley of the River Fromus to the east. These are referred to as Special Landscape Areas (SLA), and cover a relatively large proportion of the study area.

b) Environmental design and embedded mitigation

i) Construction

7.2.13. During the construction of the road, mitigation to help to manage and reduce potential landscape and visual effects would be difficult to achieve. However, potential mitigation measures during construction include providing localised screening and areas of new planting early on, allowing such screening and planting to become established throughout construction and for the operational stage. Early planting would be likely to include locations in the vicinity of residential properties such as Farnham Hall.

7.2.14. In addition, where possible, the construction compounds would be located in close proximity to existing road infrastructure, in areas already disturbed by roads and traffic. Existing vegetation would be retained around the compound areas to reduce visibility of the compound.

7.2.15. Existing woodlands, scrub and hedgerows within the site and adjoining the site boundaries would be retained where possible.

7.2.16. Four PRoW (all footpaths) would be diverted for the construction of the road (E-243/001/0, E-243/003/0, E-243/004/0 and E-243/006/0 as discussed in **Section 7.4** of this chapter).

ii) Operation

7.2.17. A number of mitigation measures have been identified and incorporated into the design for the operational phase of the proposed development, which would help to manage and reduce potential landscape and visual effects. These include the following:

- Existing woodlands, scrub and hedgerows within the site and adjoining the site boundaries would be retained where possible.
- The proposed development would include some grassed areas and native woodland and hedgerow planting (carried out early on during construction where considered beneficial). The woodland and hedgerow

planting would be concentrated around Farnham Hall, at the two new roundabouts on the A12 and along those sections of the proposed bypass that would be on embankment.

- Four PRoW (all footpaths) would be diverted for the construction of the bypass. During the operation of the two village bypass, short diversions would be proposed to ensure safe crossing points of the two village bypass, as discussed in **Section 7.4** of this chapter.

c) Preliminary assessment of effects

i) Construction

7.2.18. During construction, there would be a localised change to the landscape character of the site and its immediate context. For example, it is likely that some woodland and sections of hedgerows would be removed, including the northern tip of Whin Covert, parts of Nuttery Belt and The Belt to the south of Farnham, and a small area of woodland located at the current junction of the A12 and the A1094. There would also be localised effects on landscape character from the presence of the temporary construction compounds. Within all landscape character types, given the localised extent of the effects and the very short-term duration of the construction period, effects are unlikely to be significant.

7.2.19. During construction, there would also be localised visual effects for users of roads, including the A12 and the A1094, and the footpaths crossed by or in close proximity to the site. It may be possible to mitigate these effects to some degree by planting off-site vegetation in advance of the construction works. However, given the temporary duration of these effects, they are unlikely to be significant.

7.2.20. There are unlikely to be views of the proposed development from the Suffolk Coasts and Heaths AONB. The construction of the proposed development would have no effect on the special qualities or the purposes of designation of the AONB.

7.2.21. The proposed route would pass through a section of the SLA associated with the River Alde. Due to the topography of this valley, the route would be on embankment, with a new bridge over the river itself. This would introduce a new feature to the valley landscape, that is of a different character to the route of the existing A12, with construction activity potentially affecting a greater area than the final route. This is likely to result in a localised significant effect on the special qualities of the SLA and the purposes of its designation, which would be adverse but short-term.

ii) Operation

7.2.22. During operation, there would be a localised effect on the character of the landscape along and immediately adjacent to the proposed route, arising from the change from arable or pastoral fields to a stretch of road with associated earthworks and infrastructure. Effects would be significant and adverse due to the permanency of the physical changes to the landscape resulting from the introduction of the road infrastructure. However, these significant effects would not be widespread, as a result of the embedded mitigation measures, and restricted to the route itself and its immediate context.

7.2.23. For the majority of the route, where it passes through 'rolling estate sandlands' or 'rolling estate claylands' landscape character types, the effects on landscape character would rapidly reduce beyond the site boundaries. Roads are not atypical in the landscape and apart from more frequent use by larger construction vehicles the use of the route is not anticipated to be different to other roads in the study area. Existing woodland and hedgerows, combined with the landform within these areas, would ensure that the key characteristics of the landscape would be largely unchanged beyond those fields immediately adjacent to the proposed route and construction compound(s). There are unlikely to be any significant effects on landscape character within the 'rolling estate sandlands' or 'rolling estate claylands' landscape character types beyond these fields.

7.2.24. Where the route passes through the 'valley meadowlands' landscape character type, effects on landscape character are likely to extend further, due to the more open nature of the River Alde valley and the elevation of the route above the existing ground level. However, beyond the A12 to the north and belts of vegetation up to 600m to the south, there are unlikely to be any significant effects on landscape character within the 'valley meadowlands' landscape character type.

7.2.25. Desk and field study has confirmed that the proposed development would not be visible from Benhall Green and Little Glemham due to a combination of intervening landform and vegetation. The proposed development may be visible from properties on the southern edges of Stratford St Andrew and Farnham, along the existing A12 and the road to St Mary's Church in Farnham. However, the closest properties in Farnham are over 500m from the proposed route, with some intervening vegetation to filter views towards it. Properties on the southern side of the A12 at Stratford St Andrew would be closer to the proposed route, but also have layers of intervening vegetation between them and the proposed road. In addition, proposed planting along the route would further prevent visibility of the proposed road, and traffic using it, once the vegetation becomes established. There are unlikely to be any significant visual effects for residents of any settlements.

7.2.26. For users of roads in the surrounding area, there are likely to be views of the new bypass from both the existing A12 and the A1094 in the vicinity of the new junctions. Beyond a maximum of approximately 400m, visibility of the proposals would be prevented by existing vegetation and buildings. Given that the proposals would be a relatively minor feature on these two routes and are not unusual features for road users to experience, there are unlikely to be any significant visual effects for users of the routes.

7.2.27. There would be direct effects on users of the four footpaths that currently cross the proposed bypass route. All routes would be permanently diverted, to allow them to cross the road at grade, although exact details of these diversions are not currently determined. For all these routes, views would be changed for the full extent of where they cross the fields immediately surrounding the route. This is likely to result in localised significant visual effects for users of the footpaths.

7.2.28. For users of Sustrans Regional Cycle Route (41/42) and the Suffolk Coastal Cycle Route, there are likely to be views of the proposed roundabout at the western end of the proposed route. However, given that the cycle route already crosses the existing A12, and the relatively short stretch of the cycle route from which the proposed road is likely to be visible, there are unlikely to be any significant visual effects for users of these routes.

7.2.29. For all other recreational routes in the vicinity of the site, views of the site itself would be largely screened by intervening vegetation or landform, with additional screening provided by the proposed planting along the route. There are unlikely to be any significant visual effects for users of these routes.

7.2.30. The proposed development may be visible from a limited number of properties near to the route. The majority of rural properties already have hedges and/or trees around them which would provide mitigation. Effects on residential amenity would be mitigated via planting as appropriate to each case as part of the embedded landscape proposals.

7.2.31. There are unlikely to be views of the proposed development from the Suffolk Coasts and Heaths AONB. There are unlikely to be any significant effects on the AONB.

7.2.32. The proposed bypass route would pass through a section of the SLA associated with the River Alde. Due to the topography of this valley, the route would be on embankment, with a new bridge over the river itself. This would introduce a new feature to the valley landscape, that is of a different character to the route of the existing A12. This is likely to result in a significant effect on the special qualities of the SLA and the purposes of its designation, which would be adverse and permanent. However, this is likely to be limited to the stretch of the valley between Stratford Bridge and Beverham Bridge/Crossing.

d) Additional mitigation and monitoring

7.2.33. The preliminary assessment of effects presented above identifies potential significant effects on the landscape character of the route and its immediate surroundings, as well as for users of localised stretches of the PRoW that cross the site and an area of the SLA.

7.2.34. The localised effects on landscape character and the SLA are unlikely to be mitigated by any additional mitigation measures as there would remain a change in the character of the site and its immediate surroundings.

e) Preliminary assessment of residual effects

7.2.35. During construction, there are unlikely to be any significant residual effects on landscape character or the AONB and there are unlikely to be any significant residual visual effects. There may be a short-term significant effect on the SLA associated with the River Alde, associated with the construction activity of the embankments and bridge across the valley.

7.2.36. Once the bypass is open, there are likely to be significant residual effects on the character of the landscape within and immediately around the site, as well as on the SLA associated with the River Alde. There are also likely to be significant residual localised effects for users of the public footpaths that currently cross the site.

f) Completing the assessment

7.2.37. The Environmental Statement (ES) would present a full Landscape and Visual Impact Assessment (LVIA) underpinning the conclusions drawn above in relation to significant effects, updated where relevant to account for any design changes and including details of the impact assessment methodology.

7.2.38. Viewpoints and selected visualisations of the proposals would be agreed with the Local Planning Authorities and key stakeholders. Viewpoints are likely to include the following locations:

- from the southern edge of both Stratford St Andrew and Farnham;
- in the vicinity of properties along the A12 at the western end of the route, in the vicinity of Farnham Hall and in the vicinity of Friday Street Farm at the eastern end of the route;
- from both the A12 and the A1094; and
- from a selection of the public footpaths that cross the site.

Table 7.2.1 Summary of effects for construction phase

Landscape and visual

Topic / Receptor	Potential Impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Landscape character	Changes to landscape character and landscape features along the route and the surrounding landscape.	Retention of established vegetation. Introduction of appropriate landscape proposals at an early stage.	Not significant	None required	Not significant
Visual receptors	Changes to views for users of roads, footpaths and bridleways in close proximity to the site.	Retention of established vegetation. Introduction of appropriate landscape proposals at an early stage.	Not significant	None required	Not significant
Suffolk Coast and Heaths AONB.	Effects on special character and purposes of designation.	None required	Not significant	None required	Not significant
SLA – River Alde valley.	Effects on special character and purposes of designation.	Retention of established vegetation. Introduction of appropriate landscape proposals at an early stage.	Significant	None required	Significant

Table 7.2.2 Summary of effects for operational phase

Landscape and visual

Topic / Receptor	Potential Impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Landscape character within the site and its surrounding context.	Introduction of a new road and with associated earthworks and infrastructure.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Significant	None	Significant
Landscape character beyond those fields the road passes through, within the 'rolling estate sandlands' or 'rolling estate claylands' landscape character types.	Changes to landscape character and key characteristics within the surrounding landscape.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Not significant	None required	Not significant
Landscape character beyond the A12 to the north and belts of vegetation up to 600m to the south, within the 'valley meadowlands' landscape character type.	Changes to landscape character and key characteristics within the surrounding landscape.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Not significant	None required	Not significant
Users of the four footpaths that currently cross the proposed route.	Direct change to existing routes and localised views of new road with associated infrastructure.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Significant	None	Significant
Other visual receptors.	Changes to views for local residents and users of roads, other footpaths and bridleways in close proximity to the site.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Not significant	None required	Not significant
Suffolk Coast and Heaths AONB.	Effects on special character and purposes of designation.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Not significant	None required	Not significant
Localised area of the Special Landscape Area – River Alde valley.	Effects on special character and purposes of designation – Localised change to the character and appearance of the river valley due to the introduction of the new road on embankment, with a new bridge over the river itself.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Significant	None	Significant

7.3. Terrestrial ecology and ornithology

7.3.1. The figure for terrestrial ecology and ornithology is presented in **Volume 3** as **Figure 7.3.1**.

a) Baseline environment

7.3.2. This baseline has been compiled following a detailed review of desk study information, including a data request from the Suffolk Biodiversity Information Service, a review of aerial photographs and Ordnance Survey (OS) maps, and a preliminary assessment of habitats from PRoW.

7.3.3. There are two European designated sites comprising Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites within a 5km radius of the two village bypass (some sites carry more than one designation). These are: the Alde-Ore Estuary SPA, SAC and Ramsar site located approximately 3.4km south-east; and Sandlings SPA located approximately 2.4km south of the proposed route alignment.

7.3.4. There are eight nationally designated sites (Sites of Special Scientific Interest (SSSI)) within 5km of the proposed bypass route, these being: Gromford Meadow SSSI located approximately 2km south-east; Blaxhall Heath SSSI located approximately 2.4km south; Sandlings Forest SSSI located approximately 2.6km south; Alde-Ore Estuary SSSI located approximately 3.4km south-east; Iken Wood SSSI located approximately 3.9km south-east; Snape Warren SSSI located approximately 3.9km south-east; Tunstall Common SSSI located approximately 4.3km south; and Cransford Meadow SSSI located approximately 5km north-west.

7.3.5. There are nine non-statutory designated County Wildlife Sites (CWS) within 2km of the two village bypass. The closest of these are Foxburrow Wood CWS and Farnham Churchyard CWS, both located approximately 60m south-east and east respectively of the proposed development at its closest point. Others include; Denny's Grove CWS, Great Glemham Wood CWS, Great Wood CWS, Benhall Churchyard CWS, Manor Farm Meadows CWS, River Fromus Marshes CWS, and Benhall Green Meadows CWS, all located 1-2km away. Four of these CWS support blocks of ancient woodland, including Denny's Grove, Great Wood, Great Glemham Wood and Foxburrow Wood.

7.3.6. The habitat within the proposed route alignment is predominantly arable farmland and arable set-aside supporting species-poor grassland. Small blocks of deciduous woodland are adjacent to the alignment, including Foxburrow Wood and Nuttery Belt, and the alignment would cross a narrow woodland strip called 'The Belt'. Hedgerows along the alignment are mainly species-poor but support mature trees.

7.3.7. The River Alde would be crossed by the proposed alignment along with coastal and floodplain grazing marsh in the river floodplain and a number of other small watercourses, ditches and drains. Downstream of the proposed route alignment, the River Alde flows into the Alde-Ore Estuary SPA, SAC and Ramsar site.

7.3.8. Deciduous woodland, hedgerows, rivers and coastal and floodplain grazing marsh are habitats of Principal Importance. Other habitat types within 500m of the proposed route alignment include a number of ponds, wood pasture and parkland and semi-improved grassland. Ponds and wood pasture and parkland are habitats of Principal Importance (Ref. 7.3.1, Section 41). A number of ancient/veteran/notable trees are present within 1km of the proposed route alignment.

7.3.9. A number of notable invertebrate species have been recorded in the wider area, predominantly associated with the wood pasture and veteran trees at Glemham Park, south-west of the proposed route alignment and the surrounding designated sites. Given that the habitat within the proposed route alignment is predominantly arable farmland and set-aside, the habitats within and in close proximity to the proposed route alignment are unlikely to be of particular importance to these invertebrates.

7.3.10. There are no recent records of great crested newts[1] (*Triturus cristatus*) but there are eight ponds within 500m of the proposed route alignment that could support this species. Habitats such as the woodland blocks, and the field and woodland margins, provide suitable habitat for the terrestrial phase of the species, including potential hibernation sites, and aid connectivity to the wider landscape.

7.3.11. The majority of the proposed route alignment consists of suboptimal habitat for reptiles[2] although field margins, in particular the arable set-aside, could provide

[1]Great crested newts are a European Protected Species (EPS), receiving protection under the Conservation of Habitats and Species Regulations (2017) (Ref. 7.3.2). They are also protected under the Wildlife and Countryside Act 1981 and are a species of principal importance for the conservation of biodiversity in England, as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006).

[2]All UK species of reptiles are protected under the Wildlife and Countryside Act 1981 (Ref. 7.3.3), making it an offence to kill or injure these species. They are also species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

suitable foraging habitat for a small number of reptiles, and there are records of common reptile species in the wider area. The proposed route alignment is unlikely to be of particular importance to reptiles.

7.3.12. Breeding birds[3] typical of open agricultural habitats are present, including linnet (*Linaria cannabina*) and yellowhammer (*Emberiza citronella*), as well as ground-nesting birds such as skylark (*Alauda arvensis*). Barn owl (*Tyto alba*) is also present in the wider area of the proposed route alignment.

7.3.13. Noctule (*Nyctalus noctule*) common pipistrelle (*Pipistrellus pipistrellus*) and brown long-eared bat (*Plecotus auratus*)[4] have been recorded in the wider area. In addition, there are three records of the rare barbastelle (*Barbastella barbastellus*); one from Sink Farm approximately 1.2km south and two from Great Glemham approximately 1.6km north. The blocks of woodland, existing hedgerows and the River Alde provide suitable habitats for foraging and commuting bats. Glemham Hall, approximately 1.2km south-west of the proposed route alignment, comprises old buildings, and numerous veteran trees are found within the grounds, both of which are likely to be suitable for supporting roosting bats. In addition, Farnham Hall and the Old Vicarage, both located to the north of the proposed route alignment, comprise a complex of old buildings, again potentially suitable for roosting bats. Overall, habitats and features along and within proximity of the proposed route alignment are likely to be of value to a number of bat species. No statutory designated site within 10km cites bats as a designated interest feature.

7.3.14. The River Alde supports otters[5] (*Lutra lutra*). Whilst otters may travel along the small watercourses, drains and ditches within the proposed route alignment, these are unlikely to be of particular importance to otters. The River Alde also supports water voles[6] (*Arvicola amphibius*). It is also possible that water voles are present on the small watercourses, drains and ditches within the proposed route alignment.

7.3.15. Badgers[7] (*Meles meles*) are widespread along the proposed route alignment.

b) Environmental design and embedded mitigation

7.3.16. A summary of the measures that have been incorporated into the design of the proposed development and would protect the existing features of ecological interest are set out below.

i) Construction

- The proposed route alignment has avoided direct land take from designated sites. Mitigation for the loss of any valuable habitats, including woodland and hedgerows, would be incorporated into the scheme design as far as possible.
- The Construction Environmental Management Plan (CEMP) would define any ecological constraints and specify any measures required during construction in relation to the presence of protected species and any required vegetation clearance works. It would specify the need for an Ecological Clerk of Works to undertake and oversee specific tasks.
- Should a great crested newt population be identified that could be fragmented by the proposed route alignment, then design measures such as newt tunnels would be included to maintain connectivity.
- Should confirmed barn owl nest sites or potential nest sites be identified within the proposed route alignment, it might be necessary to install replacement nest sites although these may need to be installed some distance from the road to reduce the potential for foraging owls to be killed in collisions with vehicles.
- Temporary construction lighting would be minimised to reduce light-spill into adjacent habitats. This would reduce impacts on nocturnal species such as bats that may use nearby habitats for roosting or foraging.
- If habitat loss for foraging bat species is considered significant, then habitat enhancement measures would need to be incorporated to replace the foraging resource available to bat species.

[3]All wild birds, their eggs and nests are protected under Section 1 of the Wildlife and Countryside Act 1981. Species such as barn owl are listed on Schedule 1 of the Wildlife and Countryside Act 1981 and are afforded extra protection against disturbance whilst nesting.

[4]All species of bat in the UK are EPSs, receiving protection under the Conservation of Habitats and Species Regulations (2017). They are also protected under the Wildlife and Countryside Act 1981. Several bat species, including soprano pipistrelle (Pipistrellus pygmaeus), brown long-eared bat, noctule and barbastelle bat are species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006). Barbastelle bats are also listed in the European Commission (EC) Habitats Directive (1992) (Ref. 7.3.4, Annex II), requiring the establishment of SACs to conserve this species.

[5]Otter is an EPS in Schedule 2 of the Conservation of Habitats and Species Regulations (2017) and protected under Schedules 5 and 6 of the Wildlife and Countryside Act 1981 and is included within Section 41 of the NERC Act (2006).

[6]Water vole is protected under Schedule 5 of the Wildlife and Countryside Act 1981 and included within Section 41 of the NERC Act (2006).

[7]Badgers are protected under the Protection of Badgers Act (1992) (Ref. 7.3.5).

- Passage for otters and water voles would be maintained during construction along the River Alde through small watercourses and ditches within the proposed route alignment. Any required flood compensation areas would also minimise impacts to ditches and watercourses to avoid interfering with suitable otter and water vole habitat.

ii) Operation

- Scheme design would incorporate measures to minimise changes in the hydrological regime of flood plain and grazing marsh habitat.
- It may be necessary to incorporate measures to deter barn owls from foraging along the road verge, as this could result in incidental mortality through collisions with road traffic. Such measures may include dense landscape planting.
- A sensitive lighting scheme would be designed using best practice to minimise light-spill into adjacent habitats. This would reduce impacts on nocturnal species such as bats that may use nearby habitats for roosting or foraging.
- If predicted noise levels are likely to significantly adversely affect key habitat features supporting sensitive species (e.g. woodland supporting roosting bats), then acoustic fencing or similar would be constructed between the road alignment and habitat supporting these species.
- Safe crossing points to facilitate the passage of bats across the road alignment may be required if key foraging or commuting routes are identified, to reduce the potential for incidental mortality as a result of bats crossing the road and colliding with vehicles. These features would also facilitate the passage of other species, such as great crested newts and badgers.
- The crossing point of the River Alde would be of a sufficient size and capacity to allow for crossing of otters including a ledge to allow passage at times of high flows. Fencing would be incorporated to guide otters to the crossing points.
- The River Alde crossing would be of sufficient size and capacity to maintain the bed and bankside and minimise shading effects. This would also maintain passage for water voles.

c) Preliminary assessment of effects

7.3.17. Significant effects on designated sites, plants and habitats, invertebrates, reptiles, breeding birds and badgers are not anticipated at this stage, and they are not discussed further in this section of the PEI. However, a detailed impact assessment would be presented for these habitats and species within the ES and further details of the embedded mitigation to offset any significant effects would similarly be provided.

7.3.18. Significant effects on great crested newts, bats, otters and water voles are possible. A preliminary assessment of effects on these species is provided below.

i) Construction

7.3.19. Waterbodies in the vicinity of the proposed route alignment could support breeding great crested newts. Based on the current understanding (through OS maps and aerial imagery), some ponds are close to the proposed alignment, although it is unlikely that any would be lost as a result of the road. However, suitable terrestrial habitat would be lost, potentially resulting in injury or mortality of great crested newts and loss of resting places. The proposed route alignment could also result in fragmentation of great crested newt populations. There is the potential for a significant adverse effect if the ponds and related terrestrial habitats are important for great crested newts.

7.3.20. Noise and lighting could potentially temporarily disturb roosting and foraging bat species, in particular within Pond Wood and Foxburrow Wood, which are close to the proposed route alignment. In addition, the construction of the proposed route alignment could impact bat roosts and foraging areas through the loss of habitat and mature trees, as well as potential population fragmentation should this habitat loss result in the severance of commuting routes. There is the potential for a significant adverse effect if hedgerows and adjacent woodland areas are important for bats.

7.3.21. The River Alde and related watercourses within and adjacent to the proposed route alignment support otters and water voles. The proposals have the potential to result in incidental mortality and disturbance to these species, as well as population fragmentation if both species are unable to maintain connectivity at the point the proposed route alignment crosses these watercourses. There is the potential for a significant adverse effect if the stretch of River Alde along the proposed route alignment and other watercourses are determined to be important for these two species.

ii) Operation

7.3.22. Both bats and great crested newts may continue to experience the fragmentation effect from construction. This impact would be largely minimised through the embedded mitigation to include habitat mitigation, newt tunnels and other measures, that would be fully described within the ES.

As such, there is unlikely to be a significant adverse effect on either bats or great crested newts during the operational phase.

d) Additional mitigation and monitoring

7.3.23. The assessment has identified the potential for significant effects to occur if great crested newts, bats, otters and water voles are present, despite the embedded mitigation measures. Additional mitigation measures may therefore be required to minimise impacts so that significant effects are avoided. Furthermore, additional mitigation measures may also be required in relation to habitats and species for which a significant effect is not anticipated, but which are nonetheless legally protected, to ensure compliance with legislation. Under the CEMP, pre-construction surveys will be required and may result in mitigation measures such as micro-siting of specific elements of the project and/or licences for protected species. Monitoring of mitigation measures may also be required to ensure its effectiveness. These measures would be presented in the ES, if relevant.

e) Preliminary assessment of residual effects

7.3.24. Significant residual effects are not likely.

f) Completing the assessment

7.3.25. To inform the development of appropriate mitigation measures and complete the ES, an extended Phase 1 habitat survey would be undertaken within the proposed route alignment. The focus of the surveys would be to identify any ecological constraints, such as the presence of legally protected species.

7.3.26. Once the surveys have been completed, the detailed ecological assessment for the ES would then be progressed, clarifying whether significant adverse effects are likely, particularly in respect of great crested newts, bats, otters and water voles. Any further embedded mitigation measures which would be required to mitigate these effects would also be defined and incorporated into the design.

Table 7.3.1 Summary of effects for construction phase

Terrestrial ecology and ornithology

Topic / Receptor	Potential Impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
European and nationally designated site: Alde-Ore Estuary SPA, SAC, Ramsar site and SSSI.	Pollutants entering the River Alde upstream of the designated site.	Appropriate surface water control and chemical management outlined in the CEMP.	Not Significant	None	Not Significant
Other European and nationally designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Non-statutory designated site: Foxburrow Wood CWS.	Alteration in vegetation structure and composition due to changes in air quality from vehicles and diesel generator emissions.	Dust management plan and dust suppression measures outlined in the CEMP.	Not significant	None required	Not significant
Other non-statutory designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Deciduous woodland	Habitat loss within 'The Belt'.	Mitigation for habitat loss incorporated into scheme design.	Not significant	None required	Not significant
Hedgerows	Habitat loss	Mitigation for habitat loss incorporated into scheme design.	Not significant	None required	Not significant
River Alde, and other watercourses and ditches.	Potential pollution from surface water run-off and spillages.	Appropriate surface water control and chemical management outlined in the CEMP. Crossing of River Alde of sufficient size and capacity to maintain bed and bankside.	Not significant	None required	Not significant
Coastal floodplain grazing marsh.	Habitat loss	None required	Not significant	None required	Not significant
	Alteration of groundwater or surface water hydrological regime. Potential pollution from surface water run-off and spillages.	Appropriate surface water control and chemical management outlined in the CEMP.	Not significant	None required	Not significant
Great crested newts.	Habitat loss and severance; and incidental injury and mortality.	Design measures, such as newt tunnels, to facilitate maintaining connectivity within any identified metapopulation.	Potential adverse significant effect.	Potential mitigation measures under Natural England licence.	Not significant
Reptiles	Habitat loss and incidental mortality.	Measures for reptile mitigation outlined in CEMP.	Not significant	None required	Not significant
Barn owl	Loss of nest sites.	Installation of replacement nest sites.	Not significant	None required	Not significant
Other breeding birds.	Loss of habitat for nesting and foraging.	Measures for nesting birds and vegetation clearance outlined in the CEMP.	Not significant	None required	Not significant

Topic / Receptor	Potential Impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Bat assemblage	Severance of commuting routes and incidental mortality.	Retention of majority of tree resource. Safe crossing points to facilitate the passage of bats across the road alignment.	Potential adverse significant effect.	Potential mitigation measures under Natural England licence.	Not significant
	Loss of roosting resource (trees).	Retention of majority of tree resource. Early provision of new roost resource (e.g. bat boxes). Bat mitigation strategy.	Potential adverse significant effect.	Potential mitigation measures under Natural England licence.	Not significant
	Noise and lighting disturbance causing fragmentation and displacement of resident bat populations.	Noise and lighting control measures set out in CEMP. Bat mitigation strategy.	Potential adverse significant effect.	Potential mitigation measures under Natural England licence.	Not significant
Otters	Habitat loss and severance.	Passage for otters maintained.	Potential adverse significant effect.	Potential mitigation measures under Natural England licence.	Not significant
Water vole	Habitat loss and severance.	Passage for water voles maintained.	Potential adverse significant effect.	Potential mitigation measures under Natural England licence.	Not significant
Badgers	Loss and severance of habitat. Disturbance or damage to existing setts.	Measures to protect badgers from construction work detailed in CEMP.	Not significant	Potential mitigation measures under Natural England licence.	Not significant

Table 7.3.2 Summary of effects for operational phase

Terrestrial ecology and ornithology

Topic / Receptor	Potential Impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
European designated site: Alde-Ore Estuary SPA, SAC and Ramsar.	Pollutants entering the River Alde upstream of the designated site.	Sustainable Urban Drainage Systems (SuDS).	Not significant	None required	Not significant
Other European and nationally designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Non-statutory designated site: Foxburrow Wood CWS.	Alteration in vegetation structure and composition due to changes in air quality from vehicles emissions.	None required	Not significant	None required	Not significant
Other non-statutory designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Coastal floodplain grazing marsh.	Alternation of groundwater or surface water hydrological regime. Potential pollution from surface water run-off and spillages.	Appropriate control measures incorporated into the design. SuDS.	Not significant	None required	Not significant
Watercourse and ditches including the River Alde.	Pollutants entering watercourses and ditches.	SuDS	Not significant	None required	Not significant
Great crested newts.	Habitat severance	Safe crossing points to facilitate the passage of animals.	Not significant	None required	Not significant
Barn owl	Incidental mortality from road collisions.	Incorporate measures to deter barn owls from foraging along road verge, e.g. dense landscape planting.	Not significant	None required	Not significant
Bat assemblage	Habitat severance for foraging and commenting bats; and incidental mortality.	Safe crossing points to facilitate the passage of bats. This would reduce incidental mortality of bats crossing the road and colliding with vehicles.	Not significant	None required	Not significant
	Impacts from noise and lighting.	Sensitive lighting scheme following best practice. Acoustic fence or similar between road alignment and habitats supporting sensitive species.	Not significant	None required	Not significant
Otters	Habitat severance	Crossing point of the River Alde would allow crossing of otters including a ledge to allow passage at times of high flows. Fencing would guide otters to crossing points.	Not significant	None required	Not significant
Water vole	Habitat severance	River Alde crossing would be of sufficient size and capacity to maintain the bed and bankside and minimise shading effects. This would also maintain passage for water voles.	Not significant	None required	Not significant

7.4. Amenity and recreation

7.4.1. The figure for amenity and recreation is presented in **Volume 3** as **Figure 7.4.1.**

a) Baseline environment

7.4.2. Amenity and recreation resources comprise PRoWs and cycle routes passing through the rural, predominantly arable agricultural landscape surrounding Stratford St Andrew and Farnham, as shown on **Figure 7.4.1.** Users of these that are likely to be affected to a greater degree and impacts are assessed below. There are other recreation resources within the 1km study area but the proposed development would be unlikely to be perceptible from most of these routes and, if it were, it would be a minor change.

7.4.3. The following four footpaths cross the route of the proposed bypass: E-243/001/0, E-243/003/0, E-243/004/0 and E-243/006/0. They extend along field and woodland edges, along tracks or across fields across the rural predominantly arable landscape south and east of Farnham.

7.4.4. Users of other recreational resources which may potentially be affected by the proposed development include:

- two footpaths west of the site between Farnham and the proposed bypass which connect to E-243/004/0;
- footpaths east of the site between the proposed bypass and Racewalk Covert; and
- the Suffolk Coastal Cycle Route and Sustrans Regional Cycle Route (41/42) which runs in a north to south direction, adjacent to the site's western boundary where it intersects with the A12.

b) Environmental design and embedded mitigation

7.4.5. All PRoW crossings of the proposed road route would be at grade. Designs for these crossings would be undertaken prior to submission of the application for development consent and may include gates, stiles and diversions to ensure minimal impact on users. Temporary diversions would be required during construction and permanent diversions during operation; the length of these would be kept to a minimum and they would be agreed with Suffolk County Council and Suffolk Coastal District Council (SCDC).

7.4.6. Existing vegetation would be retained and new native tree and shrub planting implemented to screen and contain the proposed development in views from recreational resources and to integrate it into the existing landscape, where possible, as described in the landscape and visual **Section 7.2** of this chapter. Measures to minimise noise and changes to air quality would be implemented as described in the noise and vibration **Section 7.7** and the air quality **Section 7.8** of this chapter.

c) Preliminary assessment of effects

7.4.7. People using the recreational resources may experience impacts due to physical changes to recreational resources such as PRoW diversions, changes to views and increases in noise levels, dust and other emissions caused by the proposed development.

7.4.8. The preliminary assessment of effects would be reviewed and, if necessary, modified when detailed information on project design and a rights of way strategy are known.

i) Construction

7.4.9. Users of footpaths E-243/001/0, E-243/003/0, E-243/004/0 and E-243/006/0 would be directly affected by the proposed bypass. Users would have direct views into the road corridor and would experience construction related noise and potentially small changes to air quality. There would be temporary diversions during construction. Effects are likely to be significant and temporary for the duration of construction.

7.4.10. Users of the two footpaths west of the site between Farnham and the proposed bypass, the footpaths east of the site between the proposed bypass and Racewalk Covert, and Sustrans Regional Cycle Route (41/42) and the Suffolk Coastal Cycle Route are likely to have views of and potentially hear noise from the construction works but effects are unlikely to be significant.

ii) Operation

7.4.11. Users of footpaths E-243/001/0, E-243/003/0, E-243/004/0 and E-243/006/0 would be directly affected as they would be diverted and would experience changes to their views and noise levels. They may also experience small changes in air quality. Effects are likely to be significant.

7.4.12. Users of the two footpaths west of the site between Farnham and the proposed bypass, the footpaths east of the site between the proposed bypass and Racewalk Covert, and Sustrans Regional Cycle Route (41/42) and the Suffolk Coastal Cycle Route would be likely to have views of the bypass and potentially hear traffic-related noise but effects are unlikely to be significant.

7.4.13. The proposed bypass would result in less traffic on the existing bypassed section of the A12 through Farnham. Pedestrians and cyclists using this section of the A12 and PRoW joining the road would be less disturbed by traffic. Effects are unlikely to be significant.

7.4.14. Users of other recreational resources are unlikely to experience significant effects.

d) Additional mitigation and monitoring

7.4.15. No additional mitigation is proposed.

e) Preliminary assessment of residual effects

7.4.16. During the construction and operational stages of the proposed development there are likely to be significant residual effects on users of footpaths E-243/001/0, E-243/003/0, E-243/004/0 and E-243/006/0. There are unlikely to be significant residual effects on users of other recreational resources.

f) Completing the assessment

7.4.17. The ES would present a full amenity and recreation impact assessment updated where relevant to account for any design changes and additional assessment.

Table 7.4.1 Summary of effects for construction phase

Amenity and recreation

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Users of footpaths E-243/001/0, E-243/003/0, E-243/004/0 and E-243/006/0.	Physical changes to routes. Changes to views and noise.	Retention of established vegetation. Measures to minimise noise and changes to air quality.	Significant	None	Significant
Users of other amenity and recreation resources.	Users of some PRoW, the Sustrans Regional Cycle Route (41/42) and the Suffolk Coastal Cycle Route are likely to experience changes to views and noise.	Retention of established vegetation. Measures to minimise noise and changes to air quality.	Not significant	None	Not significant

Table 7.4.2 Summary of effects for operational phase

Amenity and recreation

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Users of footpaths E-243/001/0, E-243/003/0, E-243/004/0 and E-243/006/0.	Physical changes to routes. Changes to views and noise.	Retention of established vegetation-planting. Measures to minimise noise and changes to air quality.	Significant	None	Significant
Users of other amenity and recreation resources.	Users of some PRoW, the Sustrans Regional Cycle Route (41/42) and the Suffolk Coastal Cycle Route are likely to experience changes to views and noise.	Retention of established vegetation-planting. Measures to minimise noise and changes to air quality.	Not significant	None	Not significant

7.5. Terrestrial historic environment

7.5.1. The figure for terrestrial historic environment is presented in **Volume 3** as **Figure 7.5.1**.

a) Baseline environment

7.5.2. An archaeological desk-based assessment (DBA) has been undertaken for the two village bypass. The DBA considered existing records of archaeological features and investigations as well as historic mapping, aerial photography and documentary sources. Searches of Suffolk Historic Environment Record (HER), Historic England's Archives Monuments Information England (AMIE), and the National Heritage List for England were undertaken in April 2018. A study area of 750m from the site boundary was agreed with SCCAS and used for the DBA.

7.5.3. There are no designated assets within the site boundary.

7.5.4. There are fifteen listed buildings within the study area which are listed at **Table 7.5.3.** Two of these buildings are listed at Grade II* – The Church of St Mary (LB 1230211), Farnham, and the Church of St Andrew (LB 1231407), Stratford St Andrew. All other listed buildings within the study area are listed at Grade II and primarily comprise houses and shops to either side of the A12 in Farnham and Stratford. Farnham Manor (LB 1230210) is located to the south-east of the village. Glemham Hall Registered Park and Garden (Grade II: **Table 7.5.4**) is adjacent to the western edge of the site. The Grade II listed Benhallstock Cottages (LB 1377115) are located adjacent to the A12 to the south of Benhall Park.

7.5.5. Five HER records lie within the site, and a further 44 HER records are located within the study area. The AMIE notes 20 records within the study area, several of which duplicate the information in the HER and designated data sets. The heritage records comprise a variety of heritage features ranging from prehistoric flint artefact scatters to Second World War (WWII) pillboxes and lookouts, which are discussed more fully in the site chronology section below.

7.5.6. The Tithe and OS mapping shows a strong continuity within the field systems recorded in the study area since before the Inclosure Act 1845 (Ref. 7.5.1). Consequently, it is likely that the majority of surviving hedgerows within the site would be considered important under the Hedgerow Regulations (Ref. 7.5.2).

7.5.7. The HER includes 17 records of previous archaeological investigations undertaken across the study area including geophysical survey, trial trench evaluation and the archaeological monitoring of construction works.

7.5.8. The river valley context suggests a potential for deposits of geoarchaeological or palaeoenvironmental interest to be present.

i) Prehistoric to Iron Age

7.5.9. A small number of HER records within the site boundary date from the prehistoric period. These include widespread scatters of worked and heavily burnt flints (MSF13453, MSF13455), recorded during fieldwalking carried out in 1991 to assess proposed A12 improvement works.

7.5.10. The Portable Antiquities Scheme (PAS) has records of finds dating to the Bronze Age, including a site of metal working debris within the study area. These suggest a level of activity within the area during this period.

7.5.11. Within the study area, further remains dating from the prehistoric period are known, including two further scatters of worked and burnt flint close to the site boundary, which were found during the 1991 fieldwalking exercise (MSF13451; MSF13452).

7.5.12. Field systems, which include two main phases of prehistoric field boundaries dating from the Bronze Age and Iron Age period, were identified at Land off Hill Farm (MSF33814) during geophysical survey and evaluation (ESF 25705, ESF23208).

7.5.13. A small number of chance finds dating from the Iron Age have been found. These comprise pottery sherds (MSF13185; MSF13189), and two PAS finds of probable Iron Age date.

7.5.14. A particular feature of late Iron Age settlement in East Suffolk is the preference for relatively high ground, on spurs, overlooking the valleys (EZAA, 2004, p196), similar to the topography present to the eastern and western parts of the study area.

7.5.15. There is the potential for remains of this date to be present within the proposed route, though the nature of any such remains cannot be established with any confidence at this stage. Further archaeological investigation will allow for a more detailed understanding of this potential.

ii) Romano-British

7.5.16. No records dating to the Romano-British period are known within the site boundary. Finds of Roman pottery and metal work have been found at various locations within the study area (e.g. MSF12319, MSF11207) and a Roman tile was reportedly used within the Norman fabric of the Church of St Mary (MSF18629). The name Stratford is believed to have come from the ford by which a Roman road crossed the River Alde. This road may follow the course of a road which ran from Combretovium (Baylam House) to the supposed town of Sitomagus. It has been suggested anecdotally that the Church of St Mary sits on the site of a Roman encampment, although there is no clear material or documentary evidence for this conjecture.

7.5.17. There is no specific evidence for remains of this date to be present within the proposed site, though this possibility cannot be ruled out and further archaeological investigation will allow for a clearer understanding of this potential.

iii) Early-medieval and medieval

7.5.18. The DBA did not identify any material evidence for activity dating from the early-medieval period within the site or study area. The settlements of Benhall, Stratford and Farnham, which have names of Old English origin, are identified at Domesday, and the basic medieval administrative geography of the area appears to have been well-established by the Norman Conquest.

7.5.19. Similarly, material evidence for medieval activity is limited, other than the surviving medieval fabric of the churches. There is a possible moat to the south of the proposed route (MSF14051) and a scatter of medieval pottery was recovered from the fields west of Pond Barn (MSF13454), as well as chance finds of medieval metal objects and pottery.

7.5.20. It is likely that the modern settlement pattern around the churches, village cores and outlying farmsteads has medieval origins, and, while it is possible that outlying elements of medieval agricultural and industrial activity are present within or close to the site, it is unlikely that substantial settlement remains would be present.

7.5.21. While Glemham Park is recorded as a medieval deerpark and may have its origins in the 13th century, its present layout is a product of later design and it is best understood as a post-medieval feature.

7.5.22. It is not anticipated that there would be significant remains of this date present within the proposed route, although elements of dispersed farmsteads or industrial sites may be present. Further archaeological investigation will allow for a more detailed understanding of this potential.

iv) Post-medieval

7.5.23. Records of remains of this date are focused on the existing farmsteads and settlements within the study area, such as the site of Mollet's Barn (MSF25195), the early 19th-century buildings at Pond Barn (MSF35830) and outbuildings at Rosehill House (MSF24662).

7.5.24. The present layouts of designed landscape at Glemham Hall, which is designated as a Grade II Registered Park and Garden (1001461) at the western end of the route, and the non-designated Benhall Park (MSF14948) at the eastern end of the proposed route date from the 17th and 18th centuries.

7.5.25. The modern A12 follows the line of the Ipswich–Lowestoft turnpike road which was established during the late 19th century, and the East Suffolk Line passes through the eastern part of the study area.

7.5.26. It is not anticipated that there would be significant remains of this date present within the proposed site, although elements of dispersed farmsteads or industrial sites may be present.

7.5.27. There are a number of hedgerows, which reflect boundaries shown on the Tithe mapping, which pre-dates the Inclosure Act 1845 (Ref. 7.5.3) and would, therefore be considered important under the Hedgerow Regulations 1997, across the site. These are best considered as heritage assets of low significance for historic and aesthetic interest resulting from their contribution to historic landscape character.

v) Modern

7.5.28. The modern period experienced a general continuity of settlement and agricultural land use from the post-medieval period. HER records of modern features comprise anti-invasion defences, two WWII auxiliary hides (MSF26328; MSF26329) within Glemham Park, and a pillbox to the south of the A12 at the eastern edge of Stratford St Andrew (MSF25974).

7.5.29. Remains dating to this period have a degree of archaeological and historic interest, but are likely to be of low significance.

vi) Modern disturbance

7.5.30. Arable cultivation during the 20th century is likely to have disturbed the upper layers of any buried archaeology. Repeated ploughing, particularly subsoil ploughing, can be expected to have disturbed near surface features, although more substantial negative features such as ditches and pits are likely to be relatively well-preserved, particularly in any areas of meadow or permanent pasture. It is also possible for ploughing and natural processes to result in the development of colluvial deposits, which may preserve earlier features.

b) Environmental design and embedded mitigation

7.5.31. Change to setting arising from visibility of the proposed development, and construction noise or changes to air quality, could give rise to loss of or harm to heritage significance. Detailed design would seek to minimise perceptual change, for example, treatment of the road verges would be aimed at minimising the perceptibility of the proposed route as a new road where this can be achieved consistently with requirements for highways design.

c) Preliminary assessment of effects

i) Construction

7.5.32. Intrusive groundworks would take place across the site, including topsoil stripping and subsoil disturbance during the construction of the proposed bypass. Invasive works of this nature would adversely affect any surviving subsurface archaeological remains or deposits, reducing or removing their ability to be further interpreted, resulting in the loss of archaeological interest.

7.5.33. DBA has suggested the presence of previously unrecorded archaeological remains that are likely to be of low to moderate significance. Planned trial trenching will help to further understand this potential. Any archaeological remains within the proposed route would be substantially disturbed, if not removed entirely, by the proposed development. This would give rise to a large magnitude of change which could, in the absence of further mitigation, be significant.

7.5.34. Deposits of geoarchaeological or palaeoenvironmental interest, if present, are likely to be of low to moderate significance and disturbance from construction is likely to affect a relatively small proportion of more extensive deposit sequences. This would likely represent a low magnitude of change which is unlikely to be significant, where an agreed scheme of mitigation is in place.

7.5.35. Any loss of hedgerows is therefore best understood in terms of change to the historic landscape as a whole. This change is assessed as of medium magnitude, which would not give rise to a significant adverse effect.

7.5.36. Construction activities could potentially affect the settings of designated heritage assets within and beyond the proposed route. An initial study has been undertaken to identify designated assets which have the potential to be affected by the proposed development in accordance with Step 1 of the Historic England guidance (Good Practice Advice in Planning Note 3) (Ref. 7.5.4), and full assessment would be presented as part of the application for development consent. Limited adverse change may occur in the setting of Glemham Hall Park and Benhallstock Cottages during construction of the proposed bypass.

ii) Operation

7.5.37. In that any disturbance of archaeological heritage assets or deposits within the site would have occurred, and been effectively mitigated, during the construction of the proposed development, no direct effects on heritage assets are anticipated during the operation of the proposed bypass.

7.5.38. It is not anticipated that the increased volume of traffic on the A12 resulting from the use of the road by Sizewell C construction traffic would be sufficient to give rise to any qualitative change to setting. On completion of the bypass construction it can be expected that perceptibility of the A12 from Glemham Hall Park and Benhallstocks Lodge Cottage would remain largely unchanged from the pre-construction baseline.

7.5.39. In that the proposed route would divert traffic away from the historic village centres, it can be expected that there would be some positive effects resulting from the removal of through traffic from the villages with attendant reduction of audible and visual intrusion in the settings of the village buildings and a reduction in the perceptual separation of the two villages by the main road. This would apply primarily to Grade II listed buildings in Farnham and Stratford as well as to the Grade II* Churches of St Andrew at Stratford St Andrew and St Mary at Farnham.

d) Additional mitigation and monitoring

7.5.40. Mitigation of direct effects on heritage assets would comprise the adoption of an agreed written scheme of archaeological investigation to ensure that the archaeological interest of any significant deposits and features could be appropriately investigated, recorded and disseminated. This would ensure that the effect on buried archaeological remains and on deposits of geoarchaeological or palaeoenvironmental interests from the proposed development could be adequately mitigated, resulting in a low adverse residual effect, which would be not significant.

7.5.41. A suitable mitigation strategy will be agreed with Suffolk County Council Archaeology Service (SCCAS) once all pre-application archaeological fieldwork has been completed and the results are known. Monitoring of the agreed programme of archaeological investigation would be carried out by SCCAS during the implementation of the scheme. Publication and popular dissemination of the results of mitigation works would allow any informative and historic value to be fully realised.

e) Preliminary assessment of residual effects

7.5.42. The loss of archaeological interest through disturbance of archaeological remains and deposits within the site could have a significant adverse effect. However, following the implementation of an agreed scheme of archaeological investigation any residual effect is not expected to be significant.

7.5.43. No significant adverse effects arising from change to setting of heritage assets are anticipated. There are likely to be a number beneficial effects arising from the removal of through traffic from the villages of Farnham and Stratford St Andrew although these would not be significant.

f) Completing the assessment

7.5.44. A full archaeological assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant direct effects, and would draw upon the LVIA, noise, air quality and other assessments where appropriate.

7.5.45. This would include a settings assessment, which would be consulted on ahead of submission of the application for development consent with Historic England and the SCDC Officer. It would consider heritage assets where setting may potentially be subject to effects, their current setting, the potential change, and the magnitude of effect the proposed development may have on their setting. Any mitigation required would also be consulted upon.

7.5.46. In advance of construction field evaluation would be undertaken and this would include geophysical survey and trial trenching, the scope and extent of which would be agreed with SCCAS.

7.5.47. Once the intrusive archaeological investigation (trial trenching) is complete, an appropriate mitigation scheme for buried archaeological remains, if present, would be agreed with SCCAS.

Table 7.5.1 Summary of effects for construction phase

Terrestrial historic environment

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Previously unrecorded archaeological remains.	Disturbance or removal as a result of topsoil stripping and subsoil disturbance.	None	Significant	Agreed written scheme of archaeological investigation to ensure that the archaeological interest of any significant deposits and features could be appropriately investigated, recorded and disseminated.	Not Significant
Deposits of geoarchaeological and palaoenvironmental interest.	Disturbance or removal as a result of deeper foundation construction.	None	Not significant		Not significant
Historic Hedgerows	Loss due to construction activities/route of bypass.	Retain where possible	Not significant	None	Not significant
Glemham Hall Park and Benhallstocks Lodge Cottage.	Limited adverse change to setting.	Standard CEMP measures to limit noise and air quality disturbance.	Not significant	None	Not significant

Table 7.5.2 Summary of effects for operational phase

Terrestria historic environment

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Glemham Hall Park and Benhallstocks Lodge Cottage.	Any adverse effects would cease on completion of the construction phase.	Standard good-practice design of road verges, hedges and signage.	Not significant	None	Not significant
Grade II listed buildings in Farnham and Stratford as well as to the Grade II* Churches of St Andrew at Stratford and St Mary at Farnham.	Positive effects to setting resulting from the removal of through traffic from the villages and a reduction in the perceptual separation of the two villages by the main road.	None	Not significant	None	Not significant

Table 7.5.3 Designated heritage assets within two village bypass study area (listed buildings)

Historic England Reference	Name	Grade	Easting	Northing
1030901	Benhall Lodge Stables	II	637243	260990
1230208	Ducks Paddle Cottage	II	637074	260997
1230210	Farnham Manor	II	636547	259856
1230211	Church of St Mary	II*	636252	259970
1230212	Rose Hill House	II	637791	260058
1230213	Elm Tree Farmhouse	II	636353	260206
1230214	Elm Tree Cottage	II	636320	260212
1230215	Post Office Stores	II	636276	260114
1230216	George and Dragon	II	636259	260101
1230217	Turret Cottage	II	636280	260143
1231406	Stratford Hall	II	635420	260389
1231407	Church of St Andrew	II*	635791	260149
1278123	Four cottages 30m south of St Andrew's Church	II	635807	260113
1278707	Hill Farmhouse	II	636452	258999
1377115	Benhallstock Cottages	II	636834	260482

Table 7.5.4 Designated heritage assets within two village bypass study area (registered park and garden)

Historic England Reference	Name	Grade	Easting	Northing
1001461	Glemham Hall	II	634682	259253

7.6. Soils and agriculture

7.6.1. The figures for soils and agriculture are presented in **Volume 3** as **Figures 7.6.1** to **7.6.4.**

a) Baseline environment

7.6.2. The site is underlain by an area mapped as the Chillesford Church Sand Member (CCSM), which in places is overlain with drift deposit of Lowestoft Formation diamicton, comprising chalky till, together with outwash sands, gravels, silts and clays (Ref. 7.6.1).

7.6.3. The distribution of soil types is shown in **Figure 7.6.1** (Ref. 7.6.2). In the eastern and central parts of the site the soils are shown as being predominantly freely draining slightly acid sandy soils. These belong to the Newport Soil Association (representing a group of soil types which are typically found occurring together in a landscape). The main land use on these soils is described as being barley, other cereals, sugar beet, some carrots and potatoes, some coniferous woodland and lowland heath habitats.

7.6.4. At the western extent of the site the soils within the River Alde floodplain are described as deep, acidic, fen peat soils. These belong to the Mendham Soil Association. The main land use on these soils is described as being permanent grassland; cereals, sugar beet and potatoes with groundwater control.

7.6.5. To the west of the River Alde floodplain the soils are described as deep fine loamy soils with slowly permeable subsoils and slight seasonal waterlogging. These belong to the Burlingham Soil Association. The main land use on these soils is described as being cereals, sugar beet and other arable crops.

7.6.6. Published Agricultural Land Classification (ALC) maps (Ref. 7.6.3; See **Figures 7.6.2**) show the land within the site boundary to comprise a mix of Grade 2 and Grade 3 land associated with the freely drained soils, with Grade 4 land associated with the peat soils in the floodplain. Under the ALC system land is graded between Grade 1 and 5, with Grade 3 subdivided into 3a and 3b.

7.6.7. Land in grades 1, 2 and 3a is considered to be 'best and most versatile' land.

7.6.8. There is no published detailed ALC mapping available for the land within the site boundary **(Figure 7.6.3)**. Based on the provisional mapping the proportions of land of each grade would be as follows (noting that the full assessment would be based on detailed survey data).

Table 7.6.1 ALC grade distribution

ALC Grade	Area (ha)
2	18.57
Grade 3 (undifferentiated)	12.53
4	29.99
Total	**61.10**

7.6.9. Land within the site boundary, from aerial photographs, appears to be predominantly under arable production, with small woodland blocks or strips also present. The land within the River Alde floodplain appears to be under pasture.

7.6.10. Land in the western part of the site is under Entry Level plus Higher Level Stewardship **(Figure 7.6.4)**, with some land immediately to the north of the site under Entry Level Stewardship. There are also small areas of woodland within the site under an English Woodland Grant Scheme.

b) Environmental design and embedded mitigation

7.6.11. A summary of the measures that have been incorporated into the design of the proposed development and that would protect the existing features of soil and agricultural interest is set out below.

i) Construction

7.6.12. The sustainable re-use of the soil resource would be undertaken in line with the Construction Code of Practice for the Sustainable Use of Soil on Construction Sites (Ref. 7.6.4). This would be achieved by the development of a Soil Management Plan (SMP) identifying the soils present, proposed storage locations and handling methods and how the resource will be reused. The SMP would form part of the CEMP. Measures which would be implemented include (but are not limited to):

- completion of a Soil Resources Survey and incorporate results into a SMP;
- link the SMP to the Site Waste Management Plan (SWMP);
- ensure soils are stripped and handled in the driest condition possible;

- confine vehicle movements to defined haul routes until all the soil resource has been stripped;
- protect stockpiles from erosion and tracking over; and
- ensure physical condition of the entire replaced soil profile is sufficient for the post-construction use.

7.6.13. In areas of temporary land take, permanent surface water/agricultural drains would be installed to reinstate field drainage systems to pre-construction conditions, as far as possible.

7.6.14. All soils would be stored away from watercourses (or potential pathways to watercourses) and any potentially contaminated soil would be stored on an impermeable surface and covered to reduce leachate generation and potential migration to surface waters.

7.6.15. Industry standard measures would be put in place to control pollution, including from fuel or chemical stores, silt-laden run-off or dust.

7.6.16. Following completion of construction operations all agricultural land taken temporarily would be fully reinstated as near as practically possible to its former condition.

7.6.17. A considerate construction approach would be used to minimise potential impacts on the remainder of the landholding and on neighbouring landholdings during the construction phase. Toolbox talks would be used to inform all those working on the site of the requirements for soil handling and minimisation of disturbance to agricultural activities.

7.6.18. All fencing around the proposed development would be sufficient to resist damage by livestock and would be regularly checked and maintained in a suitable condition. Any damage to boundary fencing would be repaired immediately.

7.6.19. Measures on the control and removal of invasive weed species would be implemented where appropriate.

7.6.20. Works would cease, and the Animal Health Regional Office would be advised, should animal bones be discovered which indicate a potential burial site.

7.6.21. All movement of plant and vehicles between fields would cease in the event of a disease outbreak and Department for Environment, Food and Rural Affairs (Defra) advice would be followed to minimise the biosecurity risk associated with the continuation of works.

7.6.22. In relation to temporary and permanent land take requirements EDF Energy would liaise with landowners to understand and where possible address their concerns.

ii) Operation

7.6.23. The measures described for the construction phase would be maintained throughout the operational phase, as appropriate.

c) Preliminary assessment of effects

7.6.24. The potential for significant effects on soils and agriculture is discussed in this section. The assessment of significance is based on the embedded mitigation measures outlined above being in place.

i) Construction

7.6.25. The proposals for this site would result in the loss of up to 42.96ha of land from primary agricultural productivity. Based on the provisional mapping it is likely that a proportion of this will be best and most versatile land, likely to comprise Grade 2 and 3a.

7.6.26. Given the potential extent of best and most versatile land to be lost on a permanent basis this preliminary assessment considers that this could be a significant effect.

7.6.27. There would also be an impact on the agricultural enterprise because of the loss of a proportion of the productive land. This would be assessed on a case by case basis as required.

7.6.28. On the assumption that landowners' concerns are addressed, through appropriate mitigation, this preliminary environmental assessment considers that significant effects on the agricultural enterprise are unlikely to occur and so are not considered further.

ii) Operation

7.6.29. There would be no additional operation phase effects on the soil resource or agricultural enterprise.

d) Additional mitigation and monitoring

7.6.30. There are no mitigation measures available for the loss of best and most versatile land.

e) Preliminary assessment of residual effects

7.6.31. The embedded mitigation measures would ensure that the potential for significant effects is removed, with the exception of permanent loss of agricultural land which results in a significant effect for construction and operational phases.

f) Completing the assessment

7.6.32. Once the proposals for the development as a wh ole are finalised, a full assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects. An ALC survey would be undertaken across the site to fully inform the assessment impacts. In addition, landowner interviews would be undertaken.

Table 7.6.2 Summary of effects for construction phase

Soils and agriculture

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Agricultural land	Loss of approximately 61ha of which at least a proportion is likely to be best and most versatile land.	There are no mitigation measures available for the loss of agricultural land.	Significant	There are no additional mitigation measures available.	Significant
Agricultural businesses	Temporary impact due to the loss of a proportion of the productive land.	EDF Energy engage with all affected landowners.	Not significant	No adverse significant effects identified; additional mitigation measures are therefore not required.	Not significant

Table 7.6.3 Summary of effects for operational phase

Soils and agriculture

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Agricultural land	There are no impacts identified during the operational phase.				
Agricultural businesses	There are no impacts identified during the operational phase.				

7.7. Noise and vibration

7.7.1. The figure for noise and vibration is presented in **Volume 3** as **Figure 7.7.1.**

a) Baseline environment

7.7.2. Baseline survey work has yet to be undertaken for the two village bypass. However, consideration of the noise and vibration impact can be made without reference to existing baseline values.

7.7.3. The noise and vibration sensitive receptors which are closest to the route are shown in **Figure 7.7.1.** The receptors have been numerically coded, with the names of dwellings (where known) also shown. Some receptors have been grouped together for the purposes of coding. **Table 7.7.1** below shows the coding and corresponding names of locations, where known.b) Environmental design and embedded mitigation

Table 7.7.1 Noise and vibration receptors in the vicinity of the proposed two village bypass

Location code	Location name
1	Park Gate Farm
2	Red House Farm
3	Pond Barn Cottages
4	Pond Barn
5	The Old Vicarage
6	Farnham Hall
7	Farnham Hall Farm House
8	Mollett's Farm
9	Yew Tree Cottage
10	Benhall Stock Cottages
11	Old Police House

i) Construction

7.7.4. The standard of good practice outlined in 'British Standard BS5228-1 Noise: 2009 + A1 2014 – Code of Practice for noise and vibration control at open construction sites' (Ref. 7.7.1), would be followed. Embedded mitigation for the control of noise and vibration could include, but not be restricted to the following measures:

- selection of quiet plant and techniques in accordance with good practice in BS5228 for all construction, demolition and earth moving activities;
- selection of mechanical services (such as air conditioning condenser units and air handling units) which would ensure that limit values would be met;
- switching off equipment when not required;
- use of reversing alarms that ensure proper warning whilst minimising noise impacts off-site; and
- provision of training and instruction to construction site staff on methods and techniques of working to minimise off-site noise and vibration impacts.

7.7.5. With respect to vibration, BS 5228-2 gives detailed advice on standard good construction practice for minimising impacts from construction vibration. It is expected this would be set out in the CEMP and be a requirement of the contractors to adhere to this guidance.

7.7.6. EDF Energy would also have a system for the receipt and recording of any noise or vibration complaints from occupiers of noise sensitive receptors, and procedures for investigating and acting appropriately as necessary upon those complaints.

ii) Operation

7.7.7. A speed limit of 50 miles per hour (mph) proposed for the two village bypass would result in lower noise levels than if the national speed limit applied.

c) Preliminary assessment of effects

7.7.8. Noise and vibration levels have been predicted by calculation and modelling. A "significant" effect has been identified where levels are predicted to exceed a specified threshold value. Appropriate threshold levels are based on various standards and a relevant guidance and depend on the type of source; the sensitivity of the receptors; the time of day when it might occur; and, in some situations, on the existing noise levels in the area.

i) Construction

7.7.9. A detailed analysis of noise and vibration effects has not yet been carried out, however an initial overview of likely working techniques has enabled some initial high level conclusions to be drawn. It is assumed that no noisy construction work would take place at night.

7.7.10. The noise from activities at compound 1 would be likely to have a significant adverse effect on Park Gate Farm. The noise from activities at compound 2 would be likely to have a significant adverse effect on Benhall Cottages and Old Police House.

7.7.11. The effect of construction noise would also be significant, particularly during the breaking out of the road at receptor group 2 (as shown in **Figure 7.7.1**), Red House Farm and adjacent dwelling. It is possible that vibration may be significant at times during periods when this work is closest to the nearest sensitive premises at this receptor group. Such effects would be short-term.

7.7.12. During bridge construction, significant short-term noise effects are possible due to piling activity at Pond Barn, Pond Barn Cottages and Farnham Hall Farmhouse.

7.7.13. Noise and vibration levels at other receptors during construction are unlikely to have a significant effect.

ii) Operation

7.7.14. An initial review has been carried out to consider the noise levels produced during the worst case hour for the following strategies:

- road-led strategy, typical day and night;
- road-led strategy, busiest day and night;
- rail-led strategy, typical day and night; and
- rail-led strategy, busiest day and night.

7.7.15. A significant effect from road traffic noise is likely at Pond Barn Cottages and Farnham Hall Farmhouse during typical and busiest day for both rail and road-led strategies.

7.7.16. For other receptors and under both rail and road-led strategies, the noise and vibration effects would not be significant. It is likely that significant beneficial noise effects would arise as traffic flows through Farnham and Stratford St Andrew, would be lower under both rail and road-led strategies.

d) Additional mitigation and monitoring

i) Construction

7.7.17. In order to reduce noise from whichever of the proposed compound areas is selected, screening and layout can be used. It is likely that, with good design and screening, noise levels would be reduced to a level which would not be significant.

7.7.18. Some mitigation may be possible using portable acoustic panels adjacent to receptor group 2 (Red House Farm) during the closest construction work, although the reduction in noise level possible would depend on the working methods and constraints for screening design. This has not yet been considered in detail.

7.7.19. Mitigation to reduce levels during bridge construction at Pond Barn, Pond Barn Cottages and Farnham Hall Farmhouse may be possible (such as using a dolly and enclosure during piling). This would need to be considered when further information about the method and extent of piling work is known.

ii) Operation

7.7.20. Screening is likely to be required at some locations in order to reduce levels at locations where the noise effect is predicted to be significant. The need for screening would be determined by further assessment.

7.7.21. Monitoring would be carried out to a scheme to be agreed with local authorities. Provision would be made as necessary for monitoring of noise and vibration levels in the event of complaints being received from occupiers of noise sensitive receptors, or on request of the local authorities.

e) Preliminary assessment of residual effects

i) Construction

7.7.22. With mitigation in place, it is likely that some significant, short-term effects from noise and vibration would occur during construction at receptor group 2 and at Pond Barn, Pond Barn Cottages and Farnham Hall Farmhouse. Principal noise sources are likely to be from piling activities from the main road construction. There will also be significant noise from excavators and breakers during removal and replacement of existing road surfaces and from tipper lorries, dump trucks and concrete pumping and pouring activities. Initial estimates suggest that significant impacts from piling are likely for around two months and from breaking out for around two weeks although this may vary as construction planning evolves.

7.7.23. At all other receptors, with mitigation in place, noise and vibration effects are unlikely to be significant.

ii) Operation

7.7.24. With the proposed screening, noise effects during the operation of the road would not be significant.

f) Completing the assessment

7.7.25. Further assessment of noise and vibration impacts on residential receptors would be undertaken, including further consideration of the construction methodology, local topographical features and layouts. The ES would present a full noise and vibration assessment and would consider any new information such as amended design or construction methodologies which might be relevant, although it is anticipated that the assessment would support the preliminary conclusions drawn above.

Table 7.7.2 Summary of effects for construction phase

Noise and vibration

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Park Gate Farm.	From compound activity, if Option 1 is chosen.	Selection of plant and methodology in accordance with good practice.	Significant noise effect.	Screening	No significant effect
Benhall Stock Cottages and Old Police House.	From compound activity, if Option 2 is chosen.	Selection of plant and methodology in accordance with good practice.	Significant noise effect.	Screening	No significant effect
Receptor group 2, including Red House Farm.	From breaking out during road construction: short-term significant noise and possibly vibration impacts.	Selection of plant and methodology in accordance with good practice.	Short-term significant noise effect and potential significant vibration effect.	Screening, where possible.	Short-term significant effects from noise and vibration remain likely.
Pond Barn Cottages, Pond Barn, Farnham Hall Farmhouse.	Significant effect from bridge construction, particularly from piling.	Selection of plant and methodology in accordance with good practice.	Significant noise effect.	Enclosure and use of dolly during piling.	Significant effect remains possible.
All other receptors.	Construction activity	Selection of plant and methodology in accordance with good practice.	No significant noise or vibration impacts.	None required	No significant noise or vibration impacts.

Table 7.7.3 Summary of effects for operational phase

Noise and vibration

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Pond Barn Cottages, Pond Barn, Farnham Hall Farmhouse.	Operation of road during road and rail typical and worst case day.	Speed limit of 50mph.	Significant noise effect.	Screening	No significant effect.
All other receptors.	Operation of road at any time during either road-led or rail-led schemes.	Speed limit of 50mph.	No significant effects from noise or vibration.	Screening	No significant effect.

7.8. Air quality

a) Baseline environment

7.8.1. The closest human receptors to the proposed development are located at properties at Pond Barn Cottages, residential properties on Hill Farm, residential properties on Mollett's Farm and residential properties on Parkgate farm.

7.8.2. Gromford Meadow SSSI is the nearest statutory ecological site, which exists within 2km from the proposed development site. Given the distance to this location, it is unlikely to need consideration in the construction phase assessment, but it is considered that the impact of the proposed development on this location will require assessment in the operational phase.

7.8.3. SCDC has declared two Air Quality Management Areas (AQMAs) within its boundary (Ref. 7.8.1) due to elevated monitored concentrations of ambient nitrogen dioxide (NO2), the nearest of which is approximately 350m from the site, along the A12 at Stratford St. Andrew.

7.8.4. The current baseline at the proposed development for the construction phase has been informed by reference to Defra for sulphur dioxide (SO2), NO2 and particulate matter (PM10 and PM2.5) (Ref. 7.8.2) and local authority measurement data (Ref. 7.8.3) for NO2. Baseline concentrations of all pollutants are less than half statutory objective values.

7.8.5. Dust levels are related to the action of wind on exposed soils and climatic conditions year to year, but existing levels are likely to be low given the arable nature of the land use.

7.8.6. Achievement of air quality strategy (Ref. 7.8.4) objective values is likely to occur within the area surrounding the proposed development in future years, with anticipated improvements to vehicle emissions and background concentrations.

7.8.7. No notable changes are expected in land use in the surrounding area and it is expected that rates of dust deposition are likely to be similar to current levels.

b) Environmental design and embedded mitigation

i) Construction

7.8.8. The following mitigation measures would be embedded into the construction of the proposed development:

- site access located as far as practicable, and preferably at least 10m, from receptors;
- potentially dusty loads (loose earth, spoil, aggregates etc.) to be covered in transit;
- any potential use of concrete batching plant located as far as practicable from receptors; and
- mobile crushing and screening plant located as far as practicable from receptors.

7.8.9. Air quality impacts arising from the construction phase would be managed through a range of control measures detailed in a CEMP, supplemented by the measures appropriate to the level of risk designated to the Proposed Development under Institute of Air Quality Management (IAQM) Guidance (Ref. 7.8.5).

ii) Operation

7.8.10. The following mitigation measures would be embedded into the operation of the proposed development:

- maintain Sizewell C construction vehicles using the bypass to high standard so as to avoid excess pollution or possibility of breakdowns; and
- optimise traffic flows related to the main development site and using the bypass, in such a manner that the impact on the local road network at peak times is minimised.

c) Preliminary assessment of effects

i) Construction

7.8.11. The potential impacts associated with the construction of the proposed development include fugitive emissions of dust, emissions from non-road mobile machinery (NRMM) on the site, emissions from Heavy Goods Vehicles (HGVs) accessing the site and emissions from vehicles carrying workers to and from the site. However, given the embedded mitigation measures described above, the adverse effects would likely be negligible and would therefore not be significant for any of the proposed construction activities at the site.

7.8.12. The principal risk is anticipated to be related to earthworks, as this phase of construction can typically require a high volume of material to be moved. A high level of activity could potentially place the dust emissions category as 'Large' by IAQM classification, with the likelihood of a 'Medium' risk based on the number and sensitivity of local receptors. Each risk category has the potential to lead to proportional adverse, albeit temporary, impacts which have the potential to be significant without mitigation.

7.8.13. However, assuming all mitigation measures are effectively implemented and monitored through an effective CEMP, at the level recommended by the dust risk assessment, no significant dust effects resulting from demolition and construction activities are anticipated.

7.8.14. It is expected that the number of Heavy Duty Vehicle (HDV)[8] movements required to develop the site in the construction phase will not exceed the IAQM screening threshold (Ref. 7.8.6) of more than 100 Annual Average Daily Traffic required for a detailed dispersion modelling assessment. It is therefore unlikely there would be a significant effect on local air quality.

ii) Operation

7.8.15. There is potential for increases in pollutant concentrations at receptors located along the proposed development road during usage for Sizewell C construction. The primary source of these pollutants would be as a result of the additional vehicles using the bypass during Sizewell C construction.

7.8.16. Construction of the bypass would also have a consequential effect on the amount of traffic using the A12 through Stratford St Andrew and Farnham, which would be significantly reduced. As a result, despite the total net increase in traffic, the majority of receptors and the AQMA in Stratford St Andrew would see a notable reduction in ambient concentrations of pollutants, which would likely bring forward the revocation of the AQMA.

7.8.17. IAQM guidance has been used to determine the appropriate scale for an Air Quality Impact Assessment, and it is expected that the proposed development would require a detailed assessment, given it meets a number of IAQM criteria, including the introduction/realignment of a road. The proposed routing of the proposed development, in conjunction with the low baseline concentrations across the study area, indicates that there would unlikely be significant adverse air quality effects at receptors during operation, though there would likely be significant beneficial air quality effects on receptors along the A12 in Stratford St Andrew and Farnham.

7.8.18. There would be no significant adverse effects on AQMAs anticipated from the proposed development, though it is expected that there will be a significant beneficial impact on receptors in both villages.

7.8.19. The impacts on Gromford Meadow SSSI from the proposed development would be likely to be negligible as a percentage of the overall background deposition rates. Whilst there may be exceedances of critical loads immediately adjacent to roads, this would be attributable to background deposition, and not the development itself, and would in addition be expected to fall off rapidly with increased distance from the road. This would therefore not be significant.

7.8.20. The principal benefit to the proposed development is in Sizewell C construction traffic bypassing of the villages of Stratford St Andrew and Farnham, thus avoiding increasing, and indeed reducing, pollutant concentrations at receptors in that location. Whilst it is acknowledged that there would be a negligible adverse impact at some receptors close to the proposed development, the scheme would have an overall net benefit to the air quality in the area.

d) Additional mitigation and monitoring

7.8.21. No significant adverse effects are predicted for any phase of development and no additional mitigation measures are therefore proposed.

e) Preliminary assessment of residual effects

7.8.22. No significant adverse residual effects are predicted during the construction or operational phases.

f) Completing the assessment

7.8.23. Once the proposals are finalised, the potential air quality effects of the proposed development would be re-evaluated to confirm whether the preliminary conclusions presented above are applicable. The ES would present the full assessment considered necessary for the proposed development, underpinning the conclusions drawn in relation to the absence of significant adverse effects on local air quality, and the presence of significant beneficial effects on receptors along the existing alignment of the A12.

7.8.24. **Table 7.8.1** and **Table 7.8.2** summarise the expected air quality effects of the proposed development.

[8]HDVs include buses >3.5 tonnes in weight

Table 7.8.1 Summary of effects for construction phase

Air quality

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Construction Dust					
Human	Potential generation of nuisance dust.	As recommended in CEMP and appropriate to level of risk identified by IAQM criteria.	Considered likely to be 'Medium' risk, though not significant provided CEMP mitigation measures are adhered to.	None	Not significant
Vehicle/NRMM Emissions					
Human	Potential change in air pollutant concentrations at receptors.	As recommended in CEMP.	Unlikely to meet IAQM screening criteria requiring assessment, therefore not significant.	None	Not significant

Table 7.8.2 Summary of effects for operational phase

Air quality

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Vehicle emissions					
Human	Potential change in air pollutant concentrations at receptors.	Maintaining vehicles to high standard, avoid peak time travel and reducing traffic through both villages.	Unlikely to have significant adverse effects, likely to have significant beneficial effects.	None	Significant beneficial
Ecological	Emissions at receptors.	As above	Unlikely to have significant adverse effects.	None	Not significant

7.9. Geology and land quality

a) Baseline environment

i) Geology

7.9.1. The following provides a summary of the geology and geological characteristics within the site and site vicinity:

- made ground: potentially present associated with the construction of the A12 and farmers' tips;
- superficial deposits: Lowestoft Formation in the west and east of the site. Alluvium present on the western edge of the site associated with drains and the River Alde;
- bedrock: predominantly the CCSM, with a small area of Red Crag Formation in the east and Crag Group in the north-east;
- important geological sites: none present;
- identified geological hazards: none present;
- mining, quarrying and natural cavities: none present;
- ground stability hazards: none present; and
- unexploded ordnance (UXO) risks: low risk.

7.9.2. No exploratory hole records have been recorded within 500m of the site.

ii) Hydrology and hydrogeology

7.9.3. The following provides a summary of the hydrological and hydrogeological characteristics within the site and site vicinity:

- surface water features: River Alde crosses the site and a network of drains also run across the site, draining to the River Alde;
- superficial Aquifer: the Lowestoft Formation is classified as a Secondary (Undifferentiated) Aquifer and the alluvium as a Secondary A Aquifer;
- bedrock aquifer: the CCSM and Crag Group are classified as a Principal Aquifer;
- groundwater vulnerability: the site contains soils of high leaching potential;
- groundwater/surface water abstractions: three water abstractions located within 500m of the site, associated with agricultural uses;
- groundwater/surface water discharge consents: three discharge consents within 500m of the site, all agricultural sources to both groundwater and surface water receptors;
- pollution incidents: none recorded; and
- flood risk: areas of low, medium and high risk.

iii) Site history

7.9.4. The site currently comprises fields, roads, the River Alde and a network of drains, this land use extends back to at least the 19th century. The surrounding area comprises fields and roads in the current layout, with residential properties. Several former sand pits are also present in the area surrounding the site. In 1983, a garage was built alongside the A12, in the location of the current Stratford Service Station.

iv) Landfills and waste management sites

7.9.5. There are no historical or currently authorised landfills or waste management sites located within 500m of the site.

v) Previous investigations

7.9.6. There have been no previous ground investigations undertaken at the site.

vi) Key hazards

7.9.7. Key hazards present within the site vicinity include the following:

- activities associated with roads (on-site) including A12, unnamed road and various tracks;
- made ground (on-site) associated with fly tipping and farmers' tips;
- made ground (on-site) associated with construction of A12 and other roads;
- made ground (off-site) associated with disused sand pits 150m south and 50m east of the site;
- Stratford Service Station approximately 200m east of the site;
- farms including Parkgate Farm and Red House Farm adjacent to the west of the site; and
- changes in soil compaction, soil erosion and ground compaction.

vii) Summary of preliminary conceptual site model

7.9.8. A summary of potential contamination sources, pathways and receptors identified within the Preliminary Conceptual Site Model is provided below in **Table 7.9.1**.

7.9.9. Potential receptors and pathways as summarised in **Table 7.9.2**.

Table 7.9.1 Summary of preliminary conceptual site model

Potential source of contamination	Potential contamination	Approximate location
Roads (A12, unnamed road and various tracks).	Fuels and oils attributed to spills from vehicles on the roads included within the site boundary, plus exhaust particulates.	On-site
Made ground associated with fly tipping and farmers' tips.	A range of inorganic and organic contaminants including the potential for asbestos.	
Made ground associated with the construction of the A12 and other roads in the vicinity of the site.	A range of inorganic and organic contaminants including the potential for asbestos.	
Stratford Service Station approximately 200m east of the site's western extent.	Organic contaminants including petroleum, petrol additives, and diesel.	Off-site
Farms within surrounding area including Parkgate Farm and Red House Farm on the western extent of the site. Potential for un-mapped farmers' tips.	Contamination risk from herbicides, pesticides, silage, effluent, and fuel oils. Risk of inorganic and organic contamination including metals, hydrocarbons, PCBs and asbestos, etc.	
Made ground associated with the disused sand pits approximately 150m south and 50m east of the site.	Ground gas and a range of inorganic and organic contaminants including the potential for asbestos.	

Table 7.9.2 Potential receptors and pathways

Receptor Group	Receptor	Principal Contaminant Migration pathways
Human Health (on-site).	Pedestrians using roads and fields within the site. Agricultural workers.	Dermal contact with and ingestion of contaminants in soils, soil-derived dusts and water; and inhalation of soil-derived dust, fibres, gas and vapours.
	Construction / maintenance workers.	
Human Health (off-site).	Occupants of nearby residential and commercial properties.	Dermal contact with and ingestion of contaminants in soil-derived dusts and water that may have migrated off-site; and inhalation of soil-derived dust, fibres, gas and vapours which may have migrated off-site.
	Pedestrians accessing surrounding roads	
	Agricultural workers.	
Controlled Waters: Groundwater (on-site and off-site).	Groundwater in Principal Bedrock Aquifer.	Leaching of contaminants in soil to groundwater in underlying aquifers; and migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.
	Groundwater in Secondary A/ Undifferentiated Superficial Aquifers.	
Controlled Waters: Surface Waters on-site and off-site).	River Alde and drains/ponds.	Lateral migration of contaminated groundwater with discharge to surface watercourses as base flow; and discharge of contaminants entrained in surface water run-off followed by overland flow and discharge.
Property (on-site and off-site).	Existing on-site services and structures on and off-site proposed on-site services and structures.	Direct contact of contaminants in soil and/or groundwater with buried services; and migration of contaminated groundwater, ground gas and/or vapours along strata and preferential pathways such as service routes or differentially permeable strata.
	Crops and livestock.	Direct contact, ingestion, inhalation and uptake of soil and water contamination by crops and/or livestock; and migration of contaminated waters/dust/fibres and subsequent uptake by crops or ingestion/inhalation/dermal contact by livestock.

b) Environmental design and embedded mitigation

i) Construction

7.9.10. A summary of the measures that have been incorporated into the design of the proposed development and that would protect land quality during construction is set out below:

- A piling risk assessment in accordance with Environment Agency guidance may be required to ensure that piling techniques deemed appropriate are implemented at the site by identifying and managing potential risks as a result of creating pathways to the aquifer.
- The CEMP would specify measures required during construction, such as the following:
  - minimising the area and duration of soil exposure and timely reinstatement of vegetation or hardstanding to prevent soil erosion and reduce temporary effects on soil compaction;
  - stockpile management (such as water spraying and avoiding over stockpiling to reduce compaction of soil and loss of integrity) to prevent windblown dust and surface water run-off;
  - implementation of appropriate dust suppression measures to prevent migration of contaminated dust;
  - implementation of working methods during construction to ensure that there is no surface water run-off from the works or any stockpiles into adjacent surface watercourses/leaching into underlying groundwater in accordance with best practice;
  - hydro-seeding or covering of stockpiles where necessary to reduce soil erosion and contamination migration;
  - implementation of appropriate pollution incident control e.g. plant drip trays and spill kits;
  - implementation of appropriate and safe storage of fuel, oils and equipment during construction; and
  - implementation of an appropriate Materials Management Plan (MMP) to document how the excavated materials will be dealt with and a verification plan to record the placement of materials at the site; and
  - implementation of a SWMP.
- Remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) and ground stabilisation/improvement works would be undertaken if deemed necessary.
- Design of the road and associated structures and the selection of construction materials would be in accordance with good practice at the time of the design. The design would be required to take into account the ground conditions including the potential for ground movement, compaction, ground gas and ground aggressivity.
- The drainage/flood prevention strategies would consider the ground conditions including the permeability of the strata and the level of contamination present on-site.

ii) Operation

7.9.11. A summary of the measures that would be incorporated into the operational phase of the proposed development and that would protect land quality is set out below:

- The proposed development would be operated in accordance with the relevant regulations and best practice guidance in applying good practice and pollution prevention including:
- the construction of hardstanding to avoid spills and leaks;
- the incorporation of petrol/oil interceptors within the drainage design where considered necessary; and
- the use of appropriate SuDS schemes (refer to **Surface Water section 7.11**).

c) Preliminary assessment of effects

i) Construction

Ground contamination

7.9.12. The construction works would potentially introduce new sources of contamination and disturb and mobilise existing sources of contamination through excavation and exposure of contaminated soil, earthworks along the line of the proposed new road and any temporary haul roads, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off and ground gas migration pathways. With the incorporated embedded mitigation, including ground investigation and remediation where required, construction activities should not increase the contamination risks presented at the site and an overall minor beneficial effect is predicted. These effects would not be significant.

7.9.13. A preliminary assessment of the effects associated with ground contamination during the construction phase is summarised in **Table 7.9.3** below.

Physical effects

7.9.14. The development may also cause physical effects including changes in soil erosion, soil compaction and ground instability issues associated with stripping of topsoil, vegetation clearance, earthworks, stockpiling, movement of heavy plant, piling, temporary works and construction of the new infrastructure.

7.9.15. Bulk Earthworks along the bypass are anticipated with temporary stockpiles likely to be required on-site to allow earthworks along the road to progress and temporary works areas/haul roads to be constructed. There is also the potential for increased run-off during earthworks with a high sediment load likely to impact local surface waters. Earthworks would be planned to minimise soil exposure as far as practicable and areas required for temporary works would be reinstated as soon as possible after they are no longer required. The effects on soil erosion are considered to be temporary and therefore neutral and would not be significant.

7.9.16. There do not appear to be any ground stability hazards (landslides, historical earthquakes, modern instrument recorded earthquakes). The site is not in an area affected by coal mining. The site is also identified as having a low UXO risk. Ground conditions have not yet been confirmed but embedded mitigation would provide additional information on ground stability, compaction and the competence of the ground. Effects on soil compaction and ground stability are therefore considered to be neutral to minor beneficial and would not be significant.

7.9.17. With the embedded mitigation, physical effects are assessed to be neutral to minor beneficial. These effects would not be significant.

ii) Operation

Ground contamination

7.9.18. The operation would potentially introduce new sources of contamination. Spillages and leaks may occur and below ground services could create additional potential pathways for the migration of contamination that was not present at baseline. With embedded mitigation an overall minor beneficial effect is anticipated. These effects would not be significant.

Table 7.9.3 Construction phase contamination effects for the proposed development

Receptor	Value/Sensitivity	Baseline risk	Construction risk	Effect
Human	High	Low	Very low	Not significant
Controlled waters (groundwater).	Medium	Low	Very low	Not significant
Controlled waters (surface water).	High	Very low	Very low	Not significant
Property (existing and future structures and services).	Low	Very low	Very low	Not significant
Property (crops and livestock).	Medium	Low	Very low	Not significant

Table 7.9.4 Operational phase contamination effects for the proposed development

Receptor	Value/Sensitivity	Baseline risk	Construction risk	Effect
Human	High	Low	Very low	Not significant
Controlled waters (groundwater).	Medium	Low	Very low	Not significant
Controlled waters (surface water).	High	Very low	Very low	Not significant
Property (existing and future structures and services).	Low	Very low	Very low	Not significant
Property (existing/future crops and livestock).	Medium	Low	Very low	Not significant

7.9.19. Effects associated with ground contamination during the operational phase are summarised in **Table 7.9.4**.

Physical effects

7.9.20. Impacts in relation to physical effects including soil erosion, compaction and changes in soil stability would be mainly related to the construction phase of the development and there are not considered to be any significant effects during the operational phase.

d) Additional mitigation and monitoring

7.9.21. The preliminary assessment of effects presented above identifies no adverse significant effects during construction and operation in relation to land quality. Additional measures to mitigate significant adverse effects are not therefore required.

e) Preliminary assessment of residual effects

7.9.22. No additional mitigation is proposed beyond the embedded measures described above and the residual effects for all phases of development would remain the same as those described above in the preliminary assessment of effects. The effects would be neutral to minor beneficial and would not be significant.

f) Completing the assessment

7.9.23. A full land quality assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

7.9.24. A summary of the significance of overall effects is provided in **Table 7.9.5** and **Table 7.9.6.**

Table 7.9.5 Summary of effects for construction phase

Geology and land quality

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Ground contamination: current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Incorporation of mitigation measures into the design and construction process. Use of the CEMP.	Not significant	Not required	Not significant
Ground contamination: controlled waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant		Not significant
Ground contamination: property receptors (services/structures, crops and livestock).	Contamination from on-site sources.	Incorporation of mitigation measures into the design and construction process. Use of the CEMP.	Not significant	Not required	Not significant
Physical effects: Ground conditions.	Soil erosion, soil compaction and ground stability impacts.		Not significant		Not significant

Table 7.9.6 Summary of effects for operational phase

Geology and land quality

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Ground contamination: current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Construction methodology and associated mitigation measures would prevent impacts during operation. Operation would be in accordance with the relevant regulations and good practice.	Not significant	No adverse significant effects identified during operation. Additional mitigation measures are not therefore required.	Not significant
Ground contamination: controlled waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant		Not significant
Ground contamination: property receptors (services/structures, crops and livestock).	Contamination from on-site sources.		Not significant		Not significant
Physical effects: Ground conditions.	Soil erosion, soil compaction and ground stability impacts.		Not significant		Not significant

7.10. Groundwater

a) Baseline environment

7.10.1. Details of the geology of the two village bypass site are provided in **Section 7.9** of this chapter.

7.10.2. The diamicton of the Lowestoft Formation is classified as a Secondary Aquifer (Undifferentiated)[9] (Ref. 7.10.1).

7.10.3. The Lowestoft sand and gravel and the alluvium are classified as Secondary A Aquifers[10].

7.10.4. The CCSM, Red Crag Formation and Crag Group underlying the site are classified as Principal Aquifers[11].

7.10.5. The site does not lie within or adjacent to a groundwater Source Protection Zone (SPZ)[12]. A SPZ 3[13] is located approximately 720m north of the western boundary of the proposed development.

7.10.6. Contours shown on British Geological Survey (BGS) hydrogeological mapping (Ref. 7.10.2) suggest that Crag groundwater levels at the site are around 5m above Ordnance Datum (AOD) (approximately 0-15m below ground level (bgl) across the site). These contours are based on data from 1976 and are only indicative of current levels, however the hydrogeological regime is considered unlikely to have changed significantly in the intervening years. Further ground investigation would establish current groundwater levels at the site, however it is anticipated they would be at a similar level, based on monitoring data from the surrounding area.

7.10.7. The Lowestoft Formation at the site is expected to be of relatively low permeability and have limited hydraulic connection to the underlying bedrock groundwater. It is likely there are perched water tables in permeable lenses within the Lowestoft Formation. It is unlikely that groundwater within the Lowestoft sand and gravel and diamicton aquifers is in continuity with local surface water.

7.10.8. Groundwater may exist in beds and lenses of more granular material within the alluvium. It is possible this water may be in hydraulic continuity with the River Alde, however it is likely to be present as discontinuous lenses of perched groundwater.

7.10.9. Due to the granular and permeable nature of the Crag Group, it is likely that groundwater within the CCSM and Red Crag aquifers may be in hydraulic continuity. Due to anticipated depth to groundwater within the Crag Group, it is possible that the Principal Bedrock Aquifers are in hydraulic continuity with the River Alde, however only where no low permeability overlying superficial deposits are present and where the Crag is present at a shallow depth below ground.

7.10.10. The site is located on the Waveney and East Suffolk Chalk and Crag groundwater body (Water Framework Directive) reference GB40501G400600) (Ref. 7.10.3) This groundwater body has been classified by the Environment Agency as being of Poor Quantitative and Poor Chemical status, with an objective to being of Good Quantitative and Good Chemical status by 2027. The Poor Chemical status is attributed to impacts from agriculture. The proposed development falls within a groundwater Nitrate Vulnerable Zone.

7.10.11. Five groundwater abstractions are within 1km of the site (Ref. 7.10.4). These are located between approximately 180m and 900m of the site and are all used for agricultural purposes.

7.10.12. The Suffolk Coastal and Waveney District Strategic Flood Risk Assessment (SFRA) makes no reference to groundwater flooding across the Suffolk Coastal and Waveney District. Flood risk is discussed further in **Section 7.12**.

7.10.13. There is no known existing land contamination on the site. Further information on land quality is presented in **Section 7.9**.

7.10.14. There are no designated ecological sites on or within 1km of the site.

b) Environmental design and embedded mitigation

i) Construction

7.10.15. Construction drainage would be contained within the site and would infiltrate to ground wherever possible. Where appropriate, the existing drainage system would be used and improved.

[9]A Secondary (Undifferentiated) Aquifer is designated in cases where it has not been possible to attribute either category Secondary A or Secondary B to a rock type.

[10]Secondary A Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

[11]Principal Aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

[12]Groundwater Source Protection Zones are areas defined around groundwater sources used for public drinking water supply. The SPZ shows the risk of contamination from activities that might cause pollution in the area. The closer the activity, the greater the risk.

[13]Total catchments (Zone 3) are defined as the total area needed to support the abstraction or discharge from the protected groundwater source.

7.10.16. A piling risk assessment may be required to ensure that appropriate piling techniques are implemented at the site by identifying and managing potential risks as a result of creating pathways to groundwater.

7.10.17. The CEMP would specify measures required during enabling works and construction which could include, but not be limited to:

- implementation of working methods during construction to ensure there is no surface water run-off from the works, or any stockpiles, into adjacent surface watercourses/leaching into underlying groundwater, in accordance with best practice;
- implementation of appropriate pollution incident control e.g. plant drip trays and spill kits;
- implementation of appropriate and safe storage of fuel, oils and equipment during construction;
- implementation of an appropriate MMP to document how the excavated materials will be dealt with; and
- implementation of a SWMP.

7.10.18. Remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) and ground stabilisation/improvement works would be undertaken if further investigation and risk assessments deemed it necessary.

7.10.19. The drainage/flood prevention strategies would consider the ground conditions including the permeability of the strata and the level of contamination present on-site.

ii) Operation

7.10.20. There would be appropriate drainage for the road infrastructure, including the incorporation of Sustainable Urban Drainage Systems (SuDS) measures.

7.10.21. Where considered necessary the site would incorporate petrol/oil interceptors within the drainage design.

c) Preliminary assessment of effects

i) Construction

7.10.22. The construction includes a section of cutting of up to 5m bgl. This cutting is anticipated to be wholly within Lowestoft Till. Significant groundwater control would unlikely be required due to the limited lateral extent of groundwater within the Lowestoft Till. The impact to groundwater in the Lowestoft Till would be low and the effect not significant.

7.10.23. Cutting activities create a potential pathway for contamination generated during the construction process to reach groundwater. It is unlikely the cutting would extend beyond the base of the low permeability Lowestoft Till aquifer and into the underlying Crag aquifer. Should contamination be introduced it would likely be confined to the superficial aquifer. The impact on the Lowestoft Till groundwater would be low and the effect not significant. The impact on the Crag groundwater would be very low and the effect not significant.

7.10.24. In the event of a spill or leak during construction, the impact on groundwater within superficial deposits would be low and the effect on the Lowestoft Formation groundwater not significant.

7.10.25. The Crag groundwater would be protected from any spills or leaks by the overlying low permeability superficial deposits. The impact on the Crag groundwater would therefore be low and the effect not significant.

7.10.26. It is anticipated that, due to the distance from the site and the nature of the works, the impact on the groundwater abstractions would be low and the effect not significant.

7.10.27. Considering both the baseline conditions of the site and the environmental design and embedded mitigation, there would be no significant groundwater effects at the site.

ii) Operation

7.10.28. Contamination from any fuel spills or leaks from vehicles using the bypass would be of limited magnitude and longevity, and would be mitigated through incorporation of SuDS measures. Significant effects would be unlikely.

7.10.29. Instances where cuttings intercept the water table could have an impact on the groundwater flow and flow direction, although long-term groundwater control would unlikely be required given the limited lateral extent of groundwater within the Lowestoft Till. The impact on groundwater in the Lowestoft Till would be low and the effect not significant.

7.10.30. The drainage design for the site has not been finalised, however, it is anticipated that the proposed works would not significantly increase the impermeable area of ground cover at the site. The drainage design would intercept run-off from adjacent areas, avoiding flooding of lengths of the road that are in cutting and preventing increased run-off to adjacent areas where the road is embanked. The design would avoid, or minimise, impacts to groundwater receptors.

7.10.31. Considering both the baseline conditions of the site and the environmental design and embedded mitigation, there would be no significant groundwater effects at the site.

d) Additional mitigation and monitoring

7.10.32. Periodic inspection and maintenance of the drainage infrastructure would be required to ensure the continued efficacy of the drainage system.

e) Preliminary assessment of residual effects

7.10.33. There are not expected to be any significant adverse residual effects during the construction or operational phases.

f) Completing the assessment

7.10.34. The current road and drainage design would be developed further and informed by the results of further geotechnical testing and investigation. The final road and drainage design would be required to fully assess potential impacts to groundwater from the proposed development.

7.10.35. Once the proposals for the Sizewell C development as a whole are finalised, the full groundwater assessment of the proposals would be completed as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 7.10.1 Summary of effects for construction phase

Groundwater

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Crag groundwater (Principal Aquifer); Lowestoft Formation sand and gravel (Secondary A Aquifer); Groundwater abstractions (within 1km of site boundary).	Leaching and migration of existing contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers.	Piling risk assessment (if required); ensuring all site activities are carried out in accordance with the CEMP; remediation of on-site contamination if required; and appropriate drainage design.	Not significant	No adverse significant effects identified during construction works. Additional mitigation measures are not therefore required.	Not significant
	Migration of contaminants via preferential pathways to deeper groundwater.		Not significant		Not significant
	Construction materials and the use of construction vehicles have the potential to introduce contamination to groundwater via drips and spillages and infiltration of run-off from the construction site.		Not significant		Not significant
Lowestoft Formation diamicton (Secondary Aquifer (undifferentiated)).	Localised reduction in groundwater level and flow regime of the aquifer during dewatering to facilitate the construction of the cutting.	Piling risk assessment (if required); ensuring all site activities are carried out in accordance with the CEMP; remediation of on-site contamination if required; appropriate drainage design.	Not significant	No adverse significant effects identified during construction works. Additional mitigation measures are not therefore required.	Not significant
	Creation of preferential pathways for contamination to reach groundwater during construction of the cutting.		Not significant		Not significant
	Leaching and migration of existing contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers.		Not significant		Not significant
	Migration of contaminants via preferential pathways to deeper groundwater.		Not significant		Not significant
	Construction materials and the use of construction vehicles have the potential to introduce contamination to groundwater via drips and spillages and infiltration of run-off from the construction site.		Not significant		Not significant

Table 7.10.2 Summary of effects for operational phase

Groundwater

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Crag groundwater (Principal Aquifer); Lowestoft Formation- sand and gravel (Secondary A Aquifer); Lowestoft Formation- diamicton (Secondary Aquifer (undifferentiated)); Groundwater Abstractions (within 1km of site boundary).	Increase in the impermeable area of ground cover at the development site.	Water draining from the road infrastructure will pass through appropriate drainage, including the incorporation of SuDS and petrol/oil interceptors where necessary. This will allow infiltration to the superficial aquifer, whilst also protecting the underlying groundwater from hydrocarbon contamination.	Not significant	Periodic inspection and maintenance of the SuDS infrastructure.	Not significant
	Fuel spills or leaks infiltrating to groundwater.		Not significant		Not significant

7.11. Surface water

a) Baseline environment

i) Surface water features

7.11.1. The proposed development is located on the floodplain of the River Alde before rising onto the watershed between the Rivers Alde and Fromus. Light Detection and Ranging (LiDAR) data show that the highest ground levels, slightly higher than 26m above AOD, are located in the south of the site. Ground levels slope to both the west and east of the site, with the lowest ground levels slightly less than 4m AOD in the south-west of the site.

7.11.2. The River Alde flows through the boundary of the proposed bypass in the western area of the site. The Environment Agency's Catchment Data Explorer defines this as the reported reach of the River Alde water body (water body reference GB105035046060) (Ref. 7.11.1). The site area includes several drains, largely within the floodplain of the River Alde. The biological quality of the River Alde water body is Poor for fish and Moderate for macrophytes and phytobenthos.

7.11.3. The River Fromus is located approximately 1400m east of the proposed development at its closest point. The railway line separates the proposed development and this river. The Environment Agency's Catchment Data Explorer defines this as the reported reach of the River Fromus water body (water body reference GB105035045980) (Ref. 7.11.2). The biological quality of the River Fromus water body is Bad for invertebrates and Poor for fish.

ii) Fluvial geomorphology

7.11.4. Geomorphology and hydromorphology are key factors contributing to whether a water body can achieve or maintain Good ecological status.

7.11.5. Neither the River Alde water body nor the River Fromus water body are designated as artificial or heavily modified. The morphology of the River Alde is of sufficient quality to support Good ecological status; however, the hydrological regime does not support Good. The morphology and hydrological regime of the River Fromus is sufficient to support Good ecological status.

iii) Water quality

7.11.6. Physico-chemical and chemical data presented on Catchment Data Explorer have been reviewed for the Rivers Alde and Fromus in the vicinity of the proposed site boundary.

7.11.7. The chemical status of both rivers is Moderate.

7.11.8. The physico-chemical status of the River Alde, is Good or High for ammonia, pH, phosphate and temperature. These variables are not adversely affected by pollutants such as ammonia, copper, triclosan and zinc. The physico-chemical status of the water body is Moderate due to Poor dissolved oxygen concentration.

7.11.9. Physico-chemical data for the River Fromus indicate that the river is also at Good or High status for all quality elements, with the exception of Bad for dissolved oxygen and Poor for phosphate. This is likely to be a result of high nutrient loadings from agricultural run-off and/or treated sewage effluent and eutrophication processes.

b) Environmental design and embedded mitigation

i) Construction

7.11.10. Construction drainage would likely be contained within the site and infiltrated to ground. Where appropriate, the existing drainage system would be used and improved (e.g. at the junctions with the current road alignment).

7.11.11. Petrol/oil interceptors would be incorporated within the drainage design where necessary.

7.11.12. Mitigation measures would be incorporated into the CEMP could include, but not be limited to:

- The wheels of all vehicles would be washed before leaving site.
- Concrete and cement mixing and washing areas would be situated at least 10m away from surface water receptors. These would incorporate settlement and recirculation systems to allow water to be reused. The washing of equipment would be undertaken in a contained area, and all water would be collected for off-site disposal.
- All fuels, oils, lubricants and other chemicals would be stored in an impermeable bund with at least 110% of the stored capacity. Spill kits would be available at all times and damaged containers would be removed from site. All refuelling would take place in a dedicated impermeable area, using a bunded bowser. Biodegradable oils would be used where possible.
- Sand bags or stop logs would also be available for deployment at the outlets from the site drainage system in case of emergency spillages.
- Carefully phased construction to minimise impacts on the river.

- Implementation of buffer strips and exclusion areas on the river and floodplain ditches within the construction site.

ii) Operation

7.11.13. The proposed route runs through the floodplain of the River Alde. Culverts would be built where the route crosses existing drains and there would be a new bridge where the route crosses the river. The river would need to be diverted under this bridge.

7.11.14. Channel realignment of the River Alde would be incorporated into the design. The span of the new crossing and new culverts would be designed with reference to the Design Manual for Roads and Bridges (DMRB). The design would include features to allow 'natural' process to continue (e.g. clear spanning bridges with 'natural' banks so that the disruption to morphological processes is minimised). The realigned channel would be engineered so that the crossing point is perpendicular to the proposed development, with further measures to offset the loss and fragmentation of aquatic habitats (e.g. retention of remnant reaches of the previous alignment, establishment of buffer strips established).

7.11.15. The drainage system would incorporate SuDS measures where appropriate. Swales and drainage retention areas would be required from where water would either infiltrate to ground, discharge to existing watercourses at greenfield rates, or a combination of both. Existing drainage features/systems would be used and where possible/ appropriate, improved upon.

c) Preliminary assessment of effects

i) Construction

7.11.16. Surface water run-off would be contained within the site, with drainage to ground wherever feasible. However, the River Alde flows through the boundary of the proposed bypass in the western area of the site and several drains within the floodplain are included in the site area. As a result, a number of impacts, such as loss and fragmentation of riverine habitat, disruption of riverine processes and loss of floodplain habitats would need mitigation. The road alignment may also disrupt in-channel and floodplain flows and morphological processes.

7.11.17. No significant adverse effects have been identified at this stage although further detailed assessment is required.

ii) Operation

7.11.18. Potential effects relate to the loss of riverine and floodplain habitats and the fragmentation of remnant habitats of the River Alde water body. The road alignment may also disrupt in-channel and floodplain flows and morphological processes. The environmental design and embedded mitigation has been developed to reduce these effects. Consequently, no significant adverse effects have been identified at this stage although further assessment is required.

d) Additional mitigation and monitoring

7.11.19. Once operational, periodic inspection and maintenance of the drainage infrastructure may be required to ensure its continued efficacy.

e) Preliminary assessment of residual effects

7.11.20. The residual effects would be unchanged from the effects described above.

f) Completing the assessment

7.11.21. The current assessment is conservative, based on the design information currently available. EDF Energy anticipates that effective mitigation could be provided for the proposed development that would minimise surface water impacts. Additional investigations would be undertaken to inform design and environmental assessment. The final design of the proposed development, the need for mitigation and its form would be determined in liaison with the relevant authorities.

7.11.22. Once the proposals for the Sizewell C development are finalised, a full assessment of potential effects on the surface water environment from the proposals will be completed as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 7.11.1 Summary of effects for construction phase

Surface water

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
River Alde	Loss of riverine habitat.	Realigned channel would be incorporated into the design.	No significant effects yet identified.	No requirement yet identified.	No significant effects yet identified.
	Fragmentation of riverine habitats.	The span of the new crossing would be designed with reference to the DMRB, ensuring potential effects are minimised. The realigned channel would be engineered so that the crossing point is perpendicular to the proposed development.	No significant effects yet identified.	No requirement yet identified.	No significant effects yet identified.
	Disruption of riverine processes.		No significant effects yet identified.	No requirement yet identified.	No significant effects yet identified.
	Loss of floodplain habitat.	New culverts would be designed with reference to the DMRB, ensuring the effects are minimised.	No significant effects yet identified.	No requirement yet identified.	No significant effects yet identified.
	Fragmentation of floodplain habitats.		No significant effects yet identified.	No requirement yet identified.	No significant effects yet identified.

Table 7.11.2 Summary of effects for operational phase

Surface water

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
River Alde	Fragmentation of riverine habitats.	The span of the new crossing would be designed with reference to the DMRB, ensuring potential effects are minimised. Clear-spanning bridges to allow for 'natural' channel banks. Retention of remnant reaches of the previous alignment.	No significant effects yet identified.	No requirement yet identified.	No significant effects yet identified.
	Disruption of riverine processes.		No significant effects yet identified.	No requirement yet identified.	No significant effects yet identified.
	Loss of floodplain habitat.	New culverts would be designed with reference to the DMRB, ensuring the effects are minimised. Measures to offset habitat loss and fragmentation (e.g. buffer strips).	No significant effects yet identified.	No requirement yet identified.	No significant effects yet identified.
	Fragmentation of floodplain habitats.		No significant effects yet identified.	No requirement yet identified.	No significant effects yet identified.

7.12. Flood risk

7.12.1. The figures for flood risk are presented in **Volume 3** as **Figures 7.12.1** to **7.12.2**.

a) Baseline environment

7.12.2. The proposed bypass route would cross a number of existing local roads and watercourses, including the River Alde (classed as a Main River by the Environment Agency) and two Ordinary Watercourses. There may be further drainage features the route would cross that have not been identified using OS mapping.

7.12.3. Ground elevation is around 10m AOD at the western end of the route, decreasing to around 5m AOD as the route crosses the River Alde floodplain. Elevation increases moving eastwards, to over 20m AOD at its highest point, before decreasing to around 15m AOD at the eastern end the site near the A12/A1094 junction.

7.12.4. A section of the bypass would be located in Flood Zones 2 and 3, where fluvial flood risk is high. The majority of the site, including the two construction compound options, is located in Flood Zone 1, where fluvial flood risk is low **(Figure 7.12.1)**.

7.12.5. The bypass would cross the River Alde at a location where there is an extensive functional floodplain (1 in 20-year flood extent) on either side of the watercourse, defined as Flood Zone 3b.

7.12.6. The Environment Agency 'flood risk from surface water' map identifies parts of the bypass where the surface water flood risk is currently low to high **(Figure 7.12.2).** These areas are mainly around the River Alde floodplain but also include a strip within the construction compound at the western end of the bypass. There are also several isolated topographic lows to the east of the floodplain with low to high surface water flood risk. The majority of the site has very low surface water flood risk.

7.12.7. Details of the geology of the two village bypass route are provided in **section 7.9** of this chapter. Soils at the western end of the bypass are loamy and clayey, with impeded drainage. To the east of the River Alde the soils are sandy and free draining.

7.12.8. A summary of the baseline flood risk is presented in **Table 7.12.1.**

b) Environmental design and embedded mitigation

7.12.9. The Sequential Test aims to steer new development away from areas with a higher risk of flooding. Under the vulnerability classification, the proposed development would be considered as '*Essential Infrastructure*'.

7.12.10. The Flood Risk Assessment (FRA) which would accompany the application for development consent would confirm that the proposed development provides wider sustainable benefits that outweigh the flood risk; and would be safe for its lifetime without increasing flood risk

Table 7.12.1 Summary of baseline flood risk at the two village bypass site

Source of flooding	Flood risk
Fluvial	Predominantly Low: less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%). Localised areas of Medium to High at River Alde crossing.
Tidal/Coastal	Low: Site beyond the coastal extent. Less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%). However, the area could be influenced by tide locking depending on the rate of climate change and standard of the tidal defences.
Surface water (pluvial)	Predominantly Very Low: less than 1 in 1,000 annual probability of surface water flooding in any year (<0.1%). Localised areas of Low to High; between 1 in 1,000 and greater than 1 in 30 annual probability of surface water flooding in any given year.
Groundwater	Low: superficial geology is variable with an increased permeability located near to watercourses. No records of groundwater flooding in the SFRA.
Sewers	Low: land is largely agricultural; however, the site includes highways and isolated farmsteads. Sewers likely to be located within site.
Reservoirs and other artificial sources.	Not at risk of flooding from reservoirs or other artificial sources.

elsewhere. Although the FRA has yet to be completed, EDF Energy anticipates the design and embedded mitigation outlined below would satisfy these requirements.

i) Construction

7.12.11. Early in construction, the majority of the site would likely be isolated from adjacent land parcels by the construction of shallow perimeter bunds, ensuring surface water run-off would be contained within the site.

7.12.12. The proposed construction compound(s) would include appropriate drainage, designed to ensure surface water run-off does not increase off-site flood risk or create on-site flood risk. Detention ponds would likely be required to manage the run-off.

ii) Operation

7.12.13. Culverts would be built where the route crosses existing watercourses. A new bridge would be required where the route crosses the River Alde. It is likely that flood relief arches would be required to maintain the existing flood flow routes in the floodplain.

7.12.14. A permanent drainage system would be constructed in accordance with SuDS principles and the DMRB (Ref. 7.12.1). At points of connection to the existing A12 road, the drainage system would consist of a combination of channels, kerb drains and gullies, that would convey the surface water run-off to two detention ponds via underground drainage outfalls. Elsewhere along the bypass, swales along the toe of the embankment or base of cuttings will be constructed. The swales would allow infiltration to ground.

7.12.15. The detention pond in the north-east would contain surface water run-off and allow infiltration to ground. The detention pond in the south-west would contain surface water run-off and either infiltrate to ground, discharge to watercourse or a combination of both.

7.12.16. The existing drainage system would be used and improved upon, subject to further investigation. Climate change would be considered in the drainage design.

7.12.17. Flood storage compensation may be required to ensure the development does not increase flood risk elsewhere as a result of floodplain loss. Indicative areas for this compensation are shown in **Figure 7.12.1.**

7.12.18. Monitoring and maintenance of the drainage system would be carried out to preserve its integrity and maintain design capacity.

c) Preliminary assessment of effects

7.12.19. Although further design and assessment work is required, EDF Energy anticipates it should be possible to construct and operate the proposed development without an adverse impact on fluvial flood risk. The bridge, culverts and flood arch culverts would be sized to ensure that appropriate flows and capacity are maintained, whilst flood storage compensation would be provided if the final FRA identifies it is absolutely required.

7.12.20. The implementation of a drainage system, following the embedded mitigation principles outlined above, would ensure that surface water flood risk does not increase and may even be reduced.

d) Additional mitigation and monitoring

7.12.21. No further mitigation or monitoring is envisaged outside that already identified.

e) Preliminary assessment of residual effects

7.12.22. Monitoring and maintenance of the drainage infrastructure, together with suitable design for exceedance flows, would manage the minor residual risk resulting in negligible effects which are not significant.

f) Completing the assessment

7.12.23. A full FRA for the bypass route would be submitted as part of the application for development consent after the proposals for the Sizewell C development as a whole are finalised.

Table 7.12.2 Summary of effects for construction phase

Flood risk

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Surface water	Increase in impermeable area and associated surface water run-off during construction of site.	Shallow perimeter bunds constructed to contain surface water run-off on-site including an allowance for climate change.	Not significant	Monitoring and maintenance of bund to preserve integrity and maintain design capacity.	Negligible

Table 7.12.3 Summary of flood risk for operational phase

Flood risk

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Surface water	Increase in impermeable area and associated surface water run-off from the site.	Surface water from impermeable areas discharged to infiltration SuDS including an allowance for climate change and incorporate the management of existing areas flood risk.	Not significant	Monitoring and maintenance of drainage infrastructure to preserve integrity and maintain design capacity.	Negligible
Fluvial	Bypass passes over Main River and other watercourses; loss of floodplain.	The bridge, culverts and flood arch culverts would be designed to ensure that appropriate flows and capacity are maintained; flood storage compensation may be required if assessment deems it necessary.	Not significant	Monitoring and maintenance of drainage infrastructure to preserve integrity and maintain design capacity.	Negligible

7.13. Traffic and transport

a) Baseline environment

7.13.1. The proposed route of the two villages bypass crosses a number of existing unnamed roads, all of which are used by very low numbers of vehicles.

7.13.2. At present the A12 is a dual carriageway from the A14 to south of Woodbridge as well as around Wickham Market, and a single carriageway elsewhere. The section through the two villages is constrained at Farnham Bend.

7.13.3. There are a number of priority junctions within Stratford St Andrew and Farnham, the main one being the junction with Great Glemham Road.

7.13.4. The accident record of the stretch of the A12 passing through the two villages shows that no serious or fatal accidents have occurred during the past five years. One serious collision occurred between Farnham and the A1094 Friday Street junction. Five slight accidents occurred between the villages of Stratford St Andrew and Farnham.

7.13.5. The proposed route of the two villages bypass crosses a number of existing unnamed roads, all of which are used by very low numbers of vehicles.

7.13.6. There are a number of PRoW in the vicinity of the site, details of which are set out in **Section 7.4**.

b) Environmental design and embedded mitigation

7.13.7. The proposed design of the two village bypass seeks to reach an acceptable compromise between the positive and negative environmental impacts. Creation of a new road would inevitably have some environmental impacts, but diverting the A12 traffic away from Stratford St Andrew and Farnham would lead to environmental improvement in both these villages.

7.13.8. Where the bypass crosses existing local roads, these would be connected to the bypass with a new junction where feasible. For example, the access road to Pond Barn Cottages would form a new junction to allow its continued use. Local connections would minimise severance at Farnham Hall. This embedded mitigation would minimise the accessibility disruption arising from the new road.

i) Construction

7.13.9. Construction of a new bypass, as opposed to upgrading the existing road, would limit adverse transport-related effects during construction since traffic flow along the existing A12 would be largely unaffected during the construction period, with the exception of when work at the roundabouts at either end of the new bypass is taking place.

7.13.10. Construction compounds have been proposed at each end of the bypass although it is most likely that only one area would be needed.

ii) Operation

7.13.11. EDF Energy anticipates that the two village bypass would be operational before the peak period of Sizewell C construction. The two village bypass would be a permanent piece of new infrastructure and would not be removed when Sizewell C construction is completed. On a typical day during the peak period of Sizewell C construction, the two village bypass is predicted to be used by around 22,400 vehicles per day.

7.13.12. The existing road through Stratford St Andrew and Farnham would remain accessible from the roundabouts at either end, thereby offering resilience to the highway network in the case of disruption along the bypass. Once the bypass is open, the existing road through Stratford St Andrew and Farnham is predicted to be used by 300 vehicles per day, even during the peak construction period of Sizewell C.

7.13.13. The provision of roundabouts rather than priority junctions at either end of the bypass brings benefits for non-motorised users who are able to benefit from traffic islands to cross each lane (these could also have been installed at priority junctions, but not necessarily of the same scale), as well as reduced vehicle speeds which make it safer for pedestrians to cross the road.

7.13.14. The bypass design includes retention of access to the two villages via both the northern and southern roundabouts. Retention of both accesses reduces vehicle mileage by vehicles accessing Stratford St Andrew or Farnham, as well as providing a diversionary route via the old A12 alignment in case of disruption on the bypass.

c) Preliminary assessment of effects

i) Construction

7.13.15. The environmental effects of construction of the two village bypass are anticipated to be modest. During its peak construction period, the two village bypass would be served by 60 HGVs and 100 construction workers per day.

7.13.16. Construction vehicles would generate some additional trips on the highway network, but the uplift would be minimal compared to the existing traffic volumes on the A12 and have been included in the early years traffic modelling reported in **Volume 1 Chapter 6**. The negative impact on local roads leading to the construction compounds would not be significant.

7.13.17. As the bypass is being newly constructed, existing traffic would continue to use the A12 except for when the new road is being connected to the existing A12 at the northern and southern roundabouts. Some temporary lane or road closures would be required during the construction of the roundabouts, prior to their connection to the new road. Overall the disruption to through traffic would be minor and would not be significant.

ii) Operation

7.13.18. The operation of the bypass would remove through traffic from the villages of Farnham and Stratford St Andrew, thereby delivering a major beneficial effect for users of the road in these villages and pedestrians wishing to cross it.

7.13.19. The two village bypass would not increase traffic volumes in the wider area, but may attract some vehicles back to the A12 from alternative local routes. There are no comparable routes in the vicinity for middle- and long-distance traffic, so it is unlikely that there would be any long-distance vehicles which would return to the A12 as a result of the bypass. The operation of the bypass may have a minor negative impact on traffic using local roads feeding the A12 but this would not be significant.

7.13.20. On a typical day during the construction of Sizewell C, the two village bypass would carry approximately 22,200 vehicles under the rail-led strategy and approximately 22,400 vehicles under a road-led strategy.

7.13.21. Whilst there will be some queuing on the approaches to the roundabouts at either end of the bypass, these are principally due to vehicles slowing as they approach, rather than stopping to give way. The traffic modelling work shows that both roundabouts have the capacity necessary to accommodate the forecast traffic flows and there would be no significant effects on the journey times on the A12.

d) Additional mitigation and monitoring

i) Construction

7.13.22. Consideration would be given to demand-responsive traffic signals during shuttle working for construction work at the roundabouts at each end of the bypass to minimise vehicle delays.

ii) Operation

7.13.23. No additional traffic and transport mitigation measures are proposed for the operation of the bypass.

e) Preliminary assessment of residual effects

i) Construction

7.13.24. The residual effects during construction are anticipated to be the same as those set out under preliminary effects described above.

ii) Operation

7.13.25. The residual effects during operation are anticipated to be the same as those set out under preliminary effects described above.

f) Completing the assessment

7.13.26. Once the design for the two village bypass site is developed further and in more detail, the environmental assessment can be further refined.

7.14. Comparison between rail-led and road-led strategies

7.14.1. As the design of the two village bypass is identical under both the road-led and rail-led strategies, the assessments presented in the chapters in relation to landscape and visual, terrestrial ecology, amenity and recreation, terrestrial historic environment, soils and agriculture, geology and land quality, groundwater, surface water and flood risk, are equally valid under both strategies and there would be no differences in the significance of effects between the two.

7.14.2. The traffic and transport assessment presented in this chapter is equally valid under both strategies. During the main phases of construction of Sizewell C, the rail-led strategy would add approximately 1,800 vehicles per day to the A12 passing the two villages, whilst the road-led strategy would add approximately 2,050 vehicles per day. Although noise and air quality levels would vary slightly between the strategies as a consequence, given the relatively small differences there are unlikely to differences in the significance of effects between the two strategies.

8. Northern Park and Ride PEI

8.1. Introduction to Preliminary Environmental Information (PEI)

8.1.1. The northern park and ride facility is described in detail in **Volume 1, Chapter 13** and is envisaged to comprise:

- car parking areas for around 1,250 spaces (of which 40 would be accessible spaces and 10 would be pick up only spaces);
- 10 spaces for minibuses/buses/vans;
- 80 motorcycle parking spaces;
- secure cycle parking for approximately 20 bikes;
- secure bus terminus and parking, including shelters;
- perimeter security fencing and lighting;
- a welfare building comprising toilets, bus drivers' rest room, security and administration offices;
- a security building;
- security booth;
- highway modifications on the A12, including a new roundabout to allow access to the park and ride site;
- on-site topsoil and sub-soil storage to facilitate site restoration following cessation of use of the park and ride facility; and
- external areas including roadways, footways, landscaping, surface water management areas and drainage infrastructure.

8.1.2. It is anticipated that the park and ride facility would be operational seven days a week between 05:00 and 01:00. The movement of buses would respond to the shift patterns of workers coming to and from the main development site. There would be typically fewer shifts on Fridays and at weekends.

8.1.3. The use of the park and ride facility would mirror the construction phases of Sizewell C. When the construction workforce for Sizewell C is at its peak the park and ride facility would also be at peak use. Either side of this peak, use would vary according to location of workforce and demand. The size of the site is sufficient to enable the layout to be adjusted to accommodate any temporary increase in peak use.

8.1.4. The northern park and ride facility would be a temporary facility. Once the need for the facility has ceased, the buildings and associated infrastructure would be removed in accordance with demolition and restoration plans, which would maximise the potential for re-use of building, modules and materials.

8.1.5. The proposals are likely to have some effects on the environment during construction, operation and removal and restoration phases and the principal likely significant adverse and beneficial effects are explained below.

8.1.6. This chapter presents each of the topics relevant to the site in turn, under the following sub-headings: (a) Baseline environment, (b) Environmental design and embedded mitigation, (c) Preliminary assessment of effects, (d) Additional mitigation and monitoring, (e) Preliminary assessment of residual effects and (f) Completing the assessment.

8.2. Landscape and visual

8.2.1. The figure for landscape and visual is presented in **Volume 3** as **Figure 8.2.1**.

a) Baseline environment

8.2.2. The land use within the study area selected for the Landscape and Visual Impact Assessment (LVIA) of 2 kilometres (km) from the site boundary (judged to be appropriate to cover all potentially material impacts during construction and operation) is predominantly arable farmland, with well-defined hedgerow field boundaries, interspersed with scattered woodlands and copses. The site itself is in arable use and comprises a single large field. The site boundary largely follows existing defined boundaries, except parts of the northern boundary that are located within a field north of Willow Marsh Lane.

8.2.3. The western boundary of the site is defined by the East Suffolk line and Little Nursery woodland, which borders the railway. The eastern boundary is defined by a combination of the A12 and the line of the rear boundaries of properties along the A12. The northern boundary of the site largely follows Willow Marsh Lane, which is predominantly unvegetated with only a short stretch of hedgerow and occasional small trees. The remainder of the northern boundary crosses into the field north of Willow Marsh Lane but is currently undefined on the ground.

8.2.4. With the exception of hedgerows along existing field boundaries and part of Willow Marsh Lane, there are no other landscape features within the site.

8.2.5. The topography of the site slopes generally north to south, occupying a local ridgeline running east to west through the study area towards the valley of the River Minsmere and the River Yox.

8.2.6. At a national level, the site is generally more characteristic of National Character Area 83 (NCA83): South Norfolk and High Suffolk Claylands (Ref. 8.2.1); but the study area transitions into National Character Area 82 (NCA82): Suffolk Coast and Heaths in the southern extent (Ref. 8.2.2). NCA83 covers a large area of central East Anglia and is a predominantly flat clay plateau incised by numerous small-scale wooded river valleys. NCA82 runs in a band along the coast and slightly inland. More than half of the National Character Area (NCA) is utilised for cereal crops, pig units and arable rotation farming. The remainder of the NCA is coast and lowland heaths, which are known locally as the Sandlings. There are a number of forest plantations that are collectively known as the Sandlings Forests.

8.2.7. At a local level, the site is located within the ancient estate claylands landscape character type as identified in the Suffolk County Landscape Character Assessment (Ref. 8.2.3) and shown on **Figure 8.2.1**. This is an ancient wooded landscape of arable farms, associated with low lying valley floors and undulating glacial plateaus. The key characteristics are described in the Landscape Character Assessment as:

- *"dissected Boulder Clay plateau;*
- *organic pattern of field enclosures;*
- *straight boundaries where influence of privately owned estates is strongest;*
- *enclosed former greens and commons;*
- *parklands;*
- *WWII airfields;*
- *villages with dispersed hamlets and farmsteads;*
- *timber framed buildings;*
- *distinctive estate cottages; and*
- *ancient semi-natural woodland".*

8.2.8. The locations of different groups of people within the 2km study area who may experience views of the proposed park and ride facility are shown on **Figure 8.2.1**. These include the following:

- the settlements of Yoxford and Darsham. A viewpoint will be provided on the A12 at the edge of Darsham to the south in the final Environmental Impact Assessment (EIA);
- transport routes including the A12 along the eastern boundary of the site, the A1120 to the south-west of the site, and A144 to the north. The East Suffolk line is also located along the western boundary of the site. A viewpoint will be provided from the A12 to the south-east in the final EIA;
- there are relatively few Public Rights of Way (PRoWs) in the study area, and none within the site or along the site boundary. The closest public footpaths are located to the east of the site, running east from the A12 adjacent to the north-eastern boundary, from the residential properties on the eastern boundary of the site, and running south and east from the southern corner of the site. There is also a public footpath running north to south approximately 480 metres (m) west of the site and another running east to west parallel to the A144 to the

north of the site. Viewpoints will be provided from the footpath to the west of the site in the final EIA; and

- dispersed farmsteads, with the closest residential properties being adjacent to the eastern site boundary); several individual dwellings on the eastern side of the A12, between Darsham Station and Moat Hall; a group of properties adjacent to the south of the site, immediately south of Darsham Station and along either side of the A12; an isolated dwelling at the Willow Marsh Lane level crossing; and Martins Farm approximately 680m to the west of the site. Viewpoints will be provided at White House Farm to the north-east, Martins Farm to the west and near Trustans Farm to the south-east in the final EIA.

8.2.9. Visibility from many of these locations is likely to be limited due to a combination of landform, woodland and established hedgerows. In most cases, visibility is likely to be limited to approximately 2km to the north of the site, and 500m to the east, south and west due to the presence of existing mature vegetation.

8.2.10. The Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB) is located approximately 4km to the south-east of the site and stretches north.

8.2.11. A locally designated landscape covers the valley of the River Minsmere and the River Yox to the south of the site and is referred to as a Special Landscape Area (SLA). The SLA covers much of the southern part of the study area and is located approximately 450m away at its closest point.

b) Environmental design and embedded mitigation

8.2.12. A number of mitigation measures have been identified and incorporated into the design for both the construction and operation phases of the proposed park and ride facility, which will help to manage and reduce potential environmental effects. These are likely to include the following:

- existing boundary vegetation would be retained where possible, and new planting, grassed bunding and/or fencing would be provided around site boundaries to provide screening;
- a 3m high grassed topsoil and sub-soil storage and screening bund would run along the eastern and part of the southern boundaries; and
- landscape proposals for the proposed park and ride facility include grassed areas and tree and shrub planting, and these would be maintained for the operational phase of the development before being removed when agricultural use is reinstated. These would include landscape proposals along the road from the A12 into the park and ride site.

8.2.13. It is anticipated that the retention of existing boundary vegetation proposed for the construction phase would mitigate any potential impacts during the removal and reinstatement phase. Hedgerows and trees would be replanted to replace any lost at the start of construction so as to return the site as close as possible to its pre-construction condition.

c) Preliminary assessment of effects

i) Construction

8.2.14. During construction, there would be a localised change to the landscape character of the site and its immediate context. There would also be localised visual effects for users of roads, footpaths and bridleways in close proximity to the site. Given the localised extent of the effects and the very short-term duration of these effects, they are unlikely to be significant.

ii) Operation

8.2.15. During operation, there would be a localised effect on the character of the landscape within the site, arising from the change from arable fields to car parking with associated infrastructure. The proposed bunds around most perimeters of the site would also create a change to the largely flat nature of the site at present. Effects would be significant and adverse but temporary in nature.

8.2.16. Beyond the site boundaries, effects on landscape character would rapidly reduce. Within approximately 500m of the site boundary, effects on landscape character would have reduced so that they are not significant, as straight boundaries, one of the key characteristics of the surrounding landscape, would be largely unchanged.

8.2.17. Desk and field study has confirmed that the proposed park and ride facility will not be visible from Yoxford and much of Darsham due to a combination of intervening buildings, landform and vegetation. There are unlikely to be any significant visual effects for any settlements.

8.2.18. For users of roads in the surrounding area, there are likely to be views in the short-term of the proposed park and ride facility from the A12 as it passes by the site. These views would be more open north and south of the residential properties along the route, with the route being directly affected by the proposals where it is realigned on the approaches to the roundabout at the entrance to the park and ride facility. Beyond the short-term, the proposed vegetation would begin to screen the proposed park and ride facility in these views. Given the limited lengths of these routes where views would be possible, there are unlikely to be any significant visual effects for users of any of the surrounding roads.

8.2.19. Desk and field study has confirmed that there would be relatively few locations from public rights of way where there would be visibility of the proposed park and ride facility. From those routes to the east of the A12, only the footpath east of the new roundabout would be likely to have views of the proposed park and ride facility, but this would be views of the new access road beyond the alignment of the current A12. From the public footpath west of the site, near Martin's Farm, there are only likely to be glimpsed views of the proposed park and ride facility, with taller elements visible above the Little Nursery woodland. There are unlikely to be any significant visual effects given the presence of the A12 in the foreground of views from the east and existing mature vegetation in views from the west.

8.2.20. The proposed park and ride facility may be visible from some properties near to the site. The majority of rural properties already have hedges and/or trees around them which would provide mitigation. Effects on residential amenity would be mitigated via planting as appropriate to each case as part of the embedded landscape proposals.

8.2.21. Given the distance of the Suffolk Coast and Heaths AONB from the site, and the relatively limited extent of visual effects, the proposals will have no effect on the AONB.

8.2.22. The SLA is also likely to be beyond the area where the proposals would be visible, and it is unlikely that there would be any significant effects on the special qualities of the SLA or the purposes of its designation.

iii) Removal and reinstatement

8.2.23. During restoration of the land back to agricultural use, the buildings, hard standing, site drainage, perimeter earth bunds and temporary landscaping would be removed, and the landscape and visual impacts experienced would be very similar to those of the construction phase. Given the relatively short duration of the works and the limited extent of the likely effects, the effects are unlikely to be significant.

d) Additional mitigation and monitoring

8.2.24. The preliminary assessment of effects presented above identifies potential significant effects on the landscape character of the site and its immediate surroundings during operation. The localised effects on landscape character are unlikely to be able to be mitigated by any additional mitigation measures as there will remain a fundamental change in the character of the site and its immediate surroundings.

e) Preliminary assessment of residual effects

8.2.25. During construction there are unlikely to be any significant residual effects on landscape character, designated landscapes or visual effects.

8.2.26. During the operational stage of the proposed park and ride facility, it is considered that there will be significant residual effects on the character of the landscape within and immediately around the site.

8.2.27. During restoration of the land back to agricultural use there are unlikely to be any significant residual effects on landscape character, designated landscapes or visual effects.

f) Completing the assessment

8.2.28. The Environmental Statement (ES) will present a full LVIA underpinning the conclusions drawn above in relation to significant effects, confirming mitigation requirements and will account for any further design changes. It will utilise the methodology, study area and viewpoint locations previously discussed with stakeholders.

Table 8.2.1 Summary of effects for the construction phase

Landscape and visual

Topic/receptor	Potential impact	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Landscape character.	Changes to landscape character and landscape features within the site and surrounding landscape.	Retention of established vegetation. Introduction of appropriate landscape proposals, including a 3m bund.	Not significant.	None required.	Not significant.
Visual receptors.	Changes to views for users of roads, footpaths and bridleways in close proximity to the site.	Retention of established vegetation. Introduction of appropriate landscape proposals, including a 3m bund.	Not significant.	None required.	Not significant.

Table 8.2.2 Summary of effects for the operational phase

Landscape and visual

Topic/receptor	Potential impact	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Landscape character within the site and its immediate context.	Changes to landscape character and landscape features introduction of new car parking with associated infrastructure, and proposed bunding around most perimeters of the site.	Retention of established vegetation. Introduction of appropriate landscape proposals, including a 3m bund.	Significant	None	Significant
Landscape character beyond approximately 500m of the site boundary.	Changes to landscape character and key characteristics within the surrounding landscape.	Retention of established vegetation. Introduction of appropriate landscape proposals, including a 3m bund.	Not significant.	None required.	Not significant.
Visual receptors.	Changes to views for users of roads, footpaths and bridleways in close proximity to the site.	Retention of established vegetation. Introduction of appropriate landscape proposals, including a 3m bund.	Not significant.	None required.	Not significant.
Other visual receptors within study area.	Changes to views.	Retention of established vegetation. Introduction of appropriate landscape proposals, including a 3m bund.	Not significant.	None required.	Not significant.
Suffolk Coast and Heaths AONB.	Effects on special character and purposes of designation.	None required.	Not significant.	None required.	Not significant.
SLA – River Alde valley.	Effects on special character and purposes of designation.	None required.	Not significant.	None required.	Not significant.

Table 8.2.3 Summary of effects for the removal and reinstatement phase

Landscape and visual

Topic/receptor	Potential impact	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Landscape character.	Changes to landscape character and landscape features within the site and surrounding landscape.	None required.	Not significant.	None required.	Not significant.
Visual receptors.	Changes to views for users of roads, footpaths and bridleways in close proximity to the site.	None required.	Not significant.	None required.	Not significant.

8.3. Terrestrial ecology and ornithology

8.3.1. The figures for terrestrial ecology and ornithology are presented in **Volume 3** as F**igures 8.3.1** and **8.3.2**.

a) Baseline environment

8.3.2. There are three statutory designated sites of nature conservation importance within the terrestrial ecology and ornithology study area or 5km of the proposed park and ride facility boundary. These are: Dew's Ponds Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI); Minsmere to Walberswick Heaths and Marshes SAC, Special Protection Area (SPA), Ramsar site and SSSI (this includes Westleton Heath National Nature Reserve); and Potton Hall Fields SSSI. Six non-statutory designated County Wildlife Sites are also present within 2km of the site boundary. These statutory and non-statutory designated sites have been scoped out of further assessment due to their distance from the proposed park and ride facility and the lack of impact pathways.

8.3.3. The proposed park and ride facility site comprises arable farmland with a block of broadleaved woodland (Little Nursery Wood) located on the western boundary. Broadleaved woodland is a habitat of principal importance (Ref. 8.3.1, section 41).

8.3.4. Species-poor hedgerows, also a habitat of principal importance, are present along two boundaries and neither is considered to be important (Ref. 8.3.2, Schedule 1 Part II). Several scarce plant species and non-native invasive species occur within 2km of the site although no plant species of conservation interest were recorded within the proposed park and ride facility site.

8.3.5. There are 11 ponds within 500m of the proposed park and ride facility location, excluding ponds to the east of the busy A12, which is a substantial barrier to the dispersal of great crested newts[1] (*Triturus cristatus*). One pond is present within the proposed park and ride facility site and the other ten ponds are located within gardens adjacent to the eastern boundary.

8.3.6. The pond within the proposed park and ride facility site supports a small population of great crested newts but the other ten ponds have not been surveyed. There are records of great crested newts within 480m of the proposed park and ride facility site, as well as records from the Dew's Ponds SAC (located 2.4km from the proposed park and ride facility) which is designated for great crested newts. The field margins, Little Nursery Wood, and gardens on the west side of the A12 provides habitat that is suitable for great crested newts in their terrestrial phase. There are also records for common toad (*Bufo bufo*) within 2km but it is considered unlikely that a large population of this species is present within the site.

8.3.7. There is a record of a grass snake[2] (*Natrix natrix*) 700m from the proposed park and ride facility site, but the arable farmland habitat within the site is considered to be of little value to reptile species.

8.3.8. Ten bird species listed on Schedule 1[3] have been identified within 2km of the proposed park and ride facility site. None of the Schedule 1 species recorded are considered likely to be breeding on or adjacent to the proposed park and ride facility and all are likely to be non-breeding visitors to the area. Breeding bird surveys have recorded ten species listed as species of Principal Importance[4], these being: house sparrow (*Passer domesticus*); linnet (*Carduelis cannabina*); marsh tit (*Poecile palustris*); skylark (*Alauda arvensis*); yellowhammer (*Emberiza citronella*); mistle thrush (*Turdus viscivorus*); song thrush (*Turdus philomena*); dunnock (*Prunella modularis*); and bullfinch (*Pyrrhula pyrrhula*). The breeding assemblage of birds is considered typical of the woodland and intensively managed arable habitats present.

8.3.9. Seven bat species[5] have been recorded historically within the area, these being: barbastelle (*Barbastellus barbastellus*); serotine (*Eptesicus serotinus*); Natterer's bat (*Myotis nattereri*); noctule (*Nyctalus noctula*); Nathusius' pipistrelle (*Pipistrellus nathusii*); soprano pipistrelle (*Pipistrellus pygmaeus*); and brown long-eared bat (*Plecotus auritus*). Except for common pipistrelle and soprano pipistrelle activity, low levels of bat flight and foraging activity were recorded during surveys. Surveys identified a 'big bat'[6] species (potentially serotine or noctule), common

[1] Great crested newts are a European Protected Species (EPS), receiving protection under the Conservation of Habitats and Species Regulations (2017) (Ref. 8.3.3). They are also protected under the Wildlife and Countryside Act 1981 (Ref. 8.3.4) and are a species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the National Environment and Rural Communities (NERC) Act (2006).

[2] All UK species of reptiles are protected under the Wildlife and Countryside Act 1981, making it an offence to kill or injure these species. They are also species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[3] All wild birds, their eggs and nests are protected under Section 1 of the Wildlife and Countryside Act 1981. Certain species are also listed on Schedule 1 of the Wildlife and Countryside Act 1981, which affords them extra protection against disturbance whilst nesting.

[4] Species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[5] All species of bat in the UK are EPSs, receiving protection under the Conservation of Habitats and Species Regulations (2017). They are also protected under the Wildlife and Countryside Act 1981. Several bat species, including soprano pipistrelle, brown long-eared, noctule and barbastelle bat are species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006). Barbastelle bats are also listed in the European Commission (EC) Habitats Directive (1992) (Ref. 8.3.5, Annex II), requiring the establishment of SACs to conserve this species.

[6] 'Big bat' is a group classification consisting of noctule, Leisler's bat and serotine. These species are often grouped due to the similarities and overlapping characteristics of their echolocation calls making species-specific identifications difficult and unreliable.

pipistrelle, and soprano pipistrelle emerging from and entering Little Nursery Wood, indicating the wood is likely to be used for both roosting and foraging. A confirmed brown long-eared bat roost was identified within Little Nursery Wood. Low numbers of barbastelle passes were also recorded in the vicinity of Little Nursery Wood although the number of passes did not suggest this feature was a regular/ frequently used commuting route and no barbastelle were observed emerging from Little Nursery Wood.

8.3.10. Assessment of trees with bat roost potential identified three trees within the proposed park and ride facility site with potential to support roosting bats. These three trees would be retained. A greater roost resource is present within Little Nursery Wood adjacent to the site and 41 trees within the wood were identified with the potential to support roosting bats, including the brown long-eared roost.

8.3.11. There are records of European otter[7] (*Lutra lutra*), Western European hedgehog (*Erinaceus europaeus*), brown hare (*Lepus europaeus*), water shrew (*Neomys fodiens*), and water vole[8] (*Arvicola terrestris*) within 2km of the proposed park and ride facility site. There are no records of these species within or immediately adjacent to the proposed park and ride facility site itself, other than water shrew, which was observed within the pond present.

8.3.12. There are records of several notable, and/or legally protected, invertebrate species within 2km of the site but there are no records of these from within or adjacent to the site.

b) Environmental design and embedded mitigation

8.3.13. A summary of the measures that have been incorporated into the design of the proposed park and ride facility and that would protect the existing features of ecological interest are set out below.

i) Construction

- Little Nursery Wood would be retained in its entirety with a buffer distance of 20m between the woodland and the proposed park and ride facility.
- The three trees within the development site with the potential to support roosting bats would be retained.
- The pond within the proposed park and ride facility boundary would be retained protecting the known great crested newt and water shrew populations. The pond would further be protected from construction impacts through the creation of a bund along the north-west boundary as well as a 10m buffer zone.
- Except for the loss of one small section to provide the site access, all boundary hedgerows would be retained and there would therefore be only limited direct loss of hedgerow habitat and its associated species.
- The Construction Environmental Management Plan (CEMP) will define any ecological constraints and specify any measures required during construction in relation to the presence of protected species and any required vegetation clearance works. It would specify the need for an Ecological Clerk of Works to undertake and oversee specific tasks.
- Temporary construction lighting would be designed to minimise light spill to surrounding habitats. This would minimise impacts on nocturnal species such as bats that may use the nearby tree lines or habitats for roosting or foraging.
- One-way directional newt fencing would be placed around the perimeter of the main development footprint areas (namely the car parking areas, swales and earth bunds) to prevent newts from entering the site but allow them to leave the site should they accidentally gain access. Fencing would be sited to ensure that the pond confirmed as supporting great crested newts is excluded in order to maintain connectivity with existing, suitable great crested newt habitats. This approach would eliminate the need to translocate great crested newts away from the landscaped margins of the site when these areas are returned to agriculture.

ii) Operation

- A 10m buffer from the development would be maintained along the north-east, south-east and south-west borders. This buffer area would provide some protection to existing hedgerows and assist in minimising any impacts associated with the proposed development.
- Grassed (short-cropped) earth bunds, approximately 3m in height, would be located at the northern and north-east extents of the proposed park and ride facility. This would

[7] Otter are an EPS, receiving protection under the Conservation of Habitats and Species Regulations (2017). Otter are also protected under the Wildlife and Countryside Act 1981 and are a species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[8] The water vole is protected under Schedule 5 of the Wildlife and Countryside Act 1981 and is included within Section 41 of the NERC Act (2006).

screen the adjacent landscape and any associated ecology receptors from the proposed park and ride facility.

- Operational lighting would be designed to prevent spill and exposure on to Little Nursery Wood. The lighting design for the proposed park and ride facility would comply with the lighting strategy and use light fittings chosen to limit stray light. These measures would minimise impacts on nocturnal species such as bats that may use the nearby tree lines or habitats for roosting or foraging.
- A Sustainable Drainage System (SuDS) would be implemented to minimise surface water run-off and prevent diffuse pollution from sediment arising. This design would include the incorporation of swales between the parking area and the woodland which would extend the effective buffer distance. The buffer would help minimise any indirect impact on Little Nursery Wood.
- Soft landscaping for the proposed park and ride facility includes grassed areas, tree and shrub planting, using native species, and these would be maintained for the operational phase of the development before being removed when the development is removed and land reinstated.
- The one-way directional newt fencing installed during construction would remain in place during operation.
- Two small pipes or culverts would be placed beneath the new access road to allow the passage of great crested newts underneath the road.

iii) Removal and reinstatement

8.3.14. Due to the nature of the restoration and reinstatements works, it is anticipated that the measures proposed for the construction phase would mitigate the potential impacts. When the facility has been removed, the area would be returned to its existing agricultural use. Hedgerows and trees would be replanted to replace any lost at the start of construction so as to return the site as close as possible to its pre-construction condition. No additional embedded mitigation is proposed during this phase.

c) Preliminary assessment of effects

8.3.15. Given the embedded mitigation measures proposed, this preliminary assessment only considers the habitats and species for which significant effects could occur even with these measures incorporated into the development. Where no significant effects are considered likely they are not considered further in this report but will be described within the ES to accompany the application for development consent, as appropriate.

8.3.16. Despite the embedded mitigation measures included within the design, the potential for significant effects on great crested newts cannot be excluded. A preliminary assessment of effects on these species is provided below.

i) Construction

8.3.17. The construction of the proposed park and ride facility would result in the temporary loss of arable land of suboptimal value for foraging great crested newts. The construction phase may also prevent great crested newts from accessing Little Nursery Wood, likely to be an important foraging and hibernation resource, resulting in an effective additional habitat loss of 3 hectares (ha). In addition to habitat loss and habitat severance, construction works could affect great crested newts through incidental injury or mortality. Overall, these impacts could lead to a significant adverse effect on great crested newts at the local level.

ii) Operation

8.3.18. The habitat loss and severance of Little Nursery Wood arising during the construction phase described above would remain for the duration of the operational phase. Great crested newts would also be exposed to incidental injury and mortality due to being run over by vehicles using the park and ride. However, the inclusion of the newt culverts within the access road design would minimise both the habitat severance and incidental mortality. The one-way newt fencing that would remain in place during operation would also minimise incidental mortality. As such, there is unlikely to be a significant adverse effect on great crested newts during the operational phase.

iii) Removal and reinstatement

8.3.19. By reinstating the proposed park and ride facility to its original form, the severance to Little Nursery Wood experienced by the great crested newts would be removed and the connectivity of habitats would be re-established. This would restore the ability of great crested newts to move between breeding, foraging and hibernation sites.

8.3.20. The works themselves could affect great crested newts through incidental injury or mortality, however the embedded mitigation measures proposed for the construction phase (including the newt fencing that would remain in place) would mitigate the potential impacts. As such, there is unlikely to be a significant adverse effect on great crested newts during the removal and reinstatement phase.

d) Additional mitigation and monitoring

8.3.21. The preliminary assessment presented above identifies potentially significant effects on great crested newts during construction. Additional measures to mitigate significant adverse effects are therefore required. Furthermore, additional mitigation measures may also be required in relation to habitats and species for which a significant effect is not anticipated, but which are nonetheless legally protected, to ensure compliance with the legislation. Under the CEMP, pre-construction surveys would be required and may result in mitigation measures such as micro-siting of specific elements of the project and/or licences for protected species. Monitoring of mitigation measures may also be required to ensure its effectiveness. These measures would be presented in the ES, if relevant.

i) Construction

8.3.22. Works affecting great crested newts would be carried out under a licence from Natural England, following agreement with Natural England. A method statement, which would form part of the licence application, would detail mitigation measures to be implemented before and during construction. Mitigation could include a destructive search prior to vegetation removal and soil and the translocation of any encountered great crested newts.

8.3.23. The section of hedgerow to be removed for the access road would be cleared outside of the amphibian hibernation period (October to February inclusive). If this is not possible, vegetation would be cut to the ground (to remove potential bird nesting habitat), but the roots would remain intact until hibernation is complete. The root system of vegetation would then be removed once the great crested newt hibernation season is over.

8.3.24. To minimise great crested newt habitat severance and habitat loss and to facilitate continued access to foraging and hibernation sites within Little Nursery Wood, further habitat measures are under consideration.

8.3.25. To further reduce the potential for noise and lighting disturbance to bats, close-boarded fencing would be erected along the internal side of the perimeter security fence alongside Little Nursery Wood.

ii) Operation

8.3.26. The one-way directional newt fencing and culverts would remain in place during operation to discourage newts from entering the proposed park and ride facility. Close-boarded fencing erected during the construction phase along the perimeter of the proposed park and ride facility where it abuts Little Nursery Wood would remain in place for the duration of the operational phase.

iii) Removal and reinstatement

8.3.27. The newt fencing and culverts implemented during the construction and operation phases would remain in place until the end of the restoration works to reduce the potential for newts to enter the site.

8.3.28. When the proposed park and ride facility is removed, the close-boarded fencing and landscape planting would be retained for as long as possible to ensure the buffer and screening benefits are maximised. Hedgerows would be replanted on a like-for-like basis to replace those lost at the start of construction to return the site to its pre-construction condition.

e) Preliminary assessment of residual effects

8.3.29. No significant residual effects on great crested newt populations or any other species groups or habitats are expected for any phase of the proposed park and ride facility. The measures described above would ensure that any potential for significant effects are removed and the additional mitigation measures described would ensure protected species obligations, particularly in relation to great crested newts, are met.

f) Completing the assessment

8.3.30. Once the proposals for the Sizewell C project as a whole are finalised, a full ecological assessment of the proposals will be undertaken as part of the EIA and the results presented in the ES. The ES will present the full assessment underpinning the conclusions drawn in relation to significant effects.

8.3.31. New licensing policies were introduced by Natural England in 2016 and a district licensing approach is being rolled out nationally. Great crested newt mitigation and licensing requirements are therefore subject to change and the approach to mitigation will be reviewed in further detail at the ES stage.

Table 8.3.1 Summary of effects for the construction phase

Terrestrial ecology and ornithology

Topic/receptor	Potential impact	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
European and nationally designated sites.	No direct or indirect impact pathway identified.	None required.	Not significant.	None required.	Not significant.
Non-statutory designated sites.	No direct or indirect impact pathway identified.	None required.	Not significant.	None required.	Not significant.
Little Nursery Wood.	Changes in air quality. Changes in water quality, hydrology and hydrogeology.	Retention of Little Nursery Wood with 20m buffer. Appropriate surface water control and chemical management outlined in the CEMP. Construction Surface Water Management Plan.	Not significant.	Close-boarded fencing would be erected along the internal side of the perimeter security fence alongside Little Nursery Wood to buffer and screen the woodland from construction works.	Not significant.
Hedgerows	Habitat loss.	None required, area to be lost not considered significant.	Not significant.	None required.	Not significant.
Great crested newts.	Habitat loss and severance; and incidental injury and mortality.	Retention of Little Nursery Wood with 20m buffer. Retention of pond within site with 10m buffer. Retention of majority of boundary hedgerows. Installation of one-directional newt fencing. Two small pipes or culverts would be placed beneath the new access road to allow the passage of great crested newts. Appropriate mitigation detailed within the CEMP.	Potential adverse significant effect.	Potential mitigation measures under Natural England licence.	Not significant.
Reptiles	Habitat loss and incidental mortality.	Measures for reptile mitigation outlined in CEMP.	Not significant.	None required.	Not significant.
Breeding and wintering birds.	Loss of habitat for nesting and foraging.	Measures for nesting and wintering birds and vegetation clearance outlined in the CEMP. Retention of Little Nursery Wood with 20m buffer. Retention of majority of boundary hedgerows.	Not significant.	Close-boarded fencing would be erected along the internal side of the perimeter security fence alongside Little Nursery Wood.	Not significant.
Bat assemblage.	Habitat loss through loss of arable field, hedgerow and trees.	Retention of Little Nursery Wood with 20m buffer. Retention of majority of boundary hedgerows.	Not significant.	Potential mitigation measures under Natural England licence.	Not significant.
	Disturbance from noise and lighting.	Noise and lighting control measures set out in CEMP. Retention of Little Nursery Wood with 20m buffer.	Not significant.	Potential mitigation measures under Natural England licence. Close-boarded fencing would be erected along the internal side of the perimeter security fence alongside Little Nursery Wood.	Not significant.
Badgers (if present at time of construction).	Loss and severance of habitat. Disturbance or damage to existing setts.	Measures to protect badgers from construction works detailed in CEMP.	Not significant.	Potential mitigation measures under Natural England licence.	Not significant.

Table 8.3.2 Summary of effects for the operational phase

Terrestrial ecology and ornithology

Topic/receptor	Potential impact	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
European and nationally designated sites.	No direct or indirect impact pathway identified.	None required.	Not significant.	None required.	Not significant.
Non-statutory designated sites.	No direct or indirect impact pathway identified.	None required.	Not significant.	None required.	Not significant.
Little Nursery Wood.	Changes in air quality. Changes in water quality, hydrology and hydrogeology.	10m buffer from the development would be maintained along the north-east, south-east and south-west borders. SuDS	Not significant.	Close-boarded fencing would be erected retained along the internal side of the perimeter security fence alongside Little Nursery Wood.	Not significant.
Great crested newts.	Habitat severance and incidental mortality.	One-way directional newt fencing around the perimeter of the main development footprint areas. This would also guide newts to two small pipes or culverts to allow the passage of great crested newts.	Not significant.	Close-boarded fencing would be retained along the internal side of the perimeter security fence alongside Little Nursery Wood.	Not significant.
Reptiles	Habitat severance and incidental mortality.	One-way directional reptile fencing would guide reptiles to two small pipes or culverts would be placed beneath the new access road to allow passage.	Not significant.	Same operational mitigation as described for Little Nursery Wood above.	Not significant.
Breeding and wintering birds.	No impact envisioned.	3m high grassed earth bund located at the northern and north-east extents.	No impact envisioned.	Same operational mitigation as described for great crested newts above.	No impact envisioned.
Bat assemblage.	Disturbance from noise and lighting.	10m buffer from the development would be maintained along the north-east, south-east and south-west borders.	Not significant.	Same operational mitigation as described for great crested newts above.	Not significant.

Table 8.3.3 Summary of effects for the removal and reinstatement phase

Terrestrial ecology and ornithology

Topic/receptor	Potential impact	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
European and nationally designated sites.	No direct or indirect impact pathway identified.	None required.	Not significant.	None required.	Not significant.
Non-statutory designated sites.	No direct or indirect impact pathway identified.	None required.	Not significant.	None required.	Not significant.
Hedgerows	Habitat reinstatement.	Hedgerows lost to construction would be reinstated.	Not significant.	None required.	Not significant.
Great crested newts.	Incidental mortality.	One-way directional newt fencing would remain in place for as long as possible.	Not significant.	Close-boarded fencing and landscape planting would remain in place for as long as possible.	Not significant.
	Reinstatement of hibernation and foraging habitat.	Restoration and reinstatement of habitats, such as hedgerows.	Not significant.	None required.	Not significant.
Reptiles	Incidental injury and mortality.	One-way directional reptile fencing would remain in place for as long as possible.	Not significant.	None required.	Not significant.
Breeding and wintering birds.	No impact envisioned.	3m high grassed earth bund located at the northern and north-east extents.	Not significant.	Same mitigation as described for breeding and wintering birds under construction phase.	Not significant.
Bat assemblage.	Disturbance from noise and lighting.	10m buffer from the development would be maintained along the north-east, south-east and south-west borders.	Not significant.	Potential mitigation measures under Natural England licence. Close-boarded fencing and landscape planting would remain in place for as long as possible.	Not significant.
Badgers (if present at time of works).	Disturbance or damage to existing setts.	Measures to protect badgers from decommissioning works detailed in CEMP.	Not significant.	Potential mitigation measures under Natural England licence	Not significant.

8.4. Amenity and recreation

8.4.1. The figure for amenity and recreation is presented in **Volume 3** as **Figure 8.4.1**.

a) Baseline environment

8.4.2. Amenity and recreation resources within the 1km study area adopted for the amenity and recreation assessment comprise a number of PRoWs passing through the rural, predominantly arable agricultural landscape, and an on-road Sustrans link to a National Cycle Route as shown on **Figure 8.4.1**.

8.4.3. Users of the following PRoWs and cycle routes are most likely to be affected by the proposed park and ride facility:

- Footpath E-584/010/0 which lies approximately 0.5km west of the site. This footpath runs from the driveway to Cockfield Hall in the south, to west of Sillett's Wood where it meets footpath E-154/009/0. It runs on elevated land along boundaries between arable fields west of the site, from where there are views into the site.
- Footpath E-216/002/0 which lies directly to the east of the site. This footpath runs from Priory Farm approximately 0.5km east of the site to the site boundary on the A12.
- An on-road Sustrans link to a National Cycle Route runs from Darsham Rail Station, northwards along Main Road immediately east of the site, and then turns west along Willow Marsh Lane north of the site, joining National Cycle Route 1 approximately 2.5km north-west of the site.
- There is also a branch from the A12 to the edge of Darsham along The Street east of the site. This route is not part of the National Cycle Network, but provides a direct link to it.

8.4.4. There are other PRoWs within the 1km study area but the proposed park and ride facility is unlikely to be perceptible from these routes.

b) Environmental design and mitigation

8.4.5. A number of mitigation measures have been identified and incorporated into the design of the proposed park and ride facility. These measures would be introduced at an early stage of the construction process and so contribute to the management and reduction of environmental effects for both construction and operational phases:

- existing boundary vegetation would be retained and new planting, grassed bunding and/or fencing would be provided around site boundaries to provide screening and noise mitigation;
- a 3m high grassed earth storage and screening bund would run along the eastern and part of the southern boundaries; and
- measures to minimise noise and changes to air quality would be implemented as described in the **Noise and vibration section 8.7** and the **Air quality section 8.8**.

c) Preliminary assessment of effects

8.4.6. People using the PRoWs and the Sustrans link may experience changes to views and noise levels but are unlikely to experience changes to air quality caused by the proposed park and ride facility (refer to **sections 8.7** and **8.8**).

i) Construction

8.4.7. Users of PRoW E-584/010/0 would have views into the site and are likely to hear some construction noise from a distance of approximately 0.5km. However, this would be for a temporary period and so effects on recreational amenity are unlikely to be significant.

8.4.8. Users of PRoW E-216/002/0 would have views of construction works and are likely to hear some construction noise. These would be seen and heard in context with foreground traffic on the A12, and partially visually screened by intervening buildings, existing hedgerows, and other vegetation. Effects are unlikely to be significant.

8.4.9. The on-road Sustrans link on Willow Marsh Lane to a National Cycle Route would be physically affected by construction of the new vehicle access road to the proposed park and ride facility. The cycle route is likely to be temporarily diverted for short distances during some of the construction phase, and cyclists may be delayed while, for example, construction and delivery vehicles pass along the access road. Cyclists would experience physical diversions or short-term delays, and changes to views and noise. As these changes would be temporary, they are unlikely to be significant.

ii) Operation

8.4.10. Noise levels from the park and ride facility are likely to be negligible as described in **section 8.7**.

8.4.11. Users of PRoW E-584/010/0 would have views into the operational site but are unlikely to experience changes to the noise and air quality environments. Effects are unlikely to be significant.

8.4.12. Users of PRoW E-216/002/0 are likely to have views of traffic moving along the new access road, seen in the context of traffic on the A12. Noise and air quality environments are unlikely to change in the context of effects from existing traffic on the A12. Effects are unlikely to be significant.

8.4.13. Any temporary diversions of the on-road Sustrans link on Willow Marsh Lane to a National Cycle Route would be reinstated or potentially realigned at the new junction with the access road. Willow Marsh Lane between the new junction and the A12 could become a traffic free shared footway and cycleway. Cyclists on the Sustrans link would hear and have views of traffic moving along the new access road, set within the context of existing traffic on the A12, and have views of the southern end of the park and ride facility where the route passes along the A12. The park and ride facility is likely to be largely screened by proposed 3m high landform on the northern edge of the facility. Effects are unlikely to be significant.

iii. Removal and reinstatement

8.4.14. During restoration of the land back to agricultural use, the buildings, hard standing, site drainage and temporary landscaping would be removed, and the amenity and recreation impacts experienced would be very similar to those of construction. Effects are unlikely to be significant.

d) Additional mitigation and monitoring

8.4.15. No additional mitigation is proposed.

e) Preliminary assessment of residual effects

8.4.16. No significant residual effects are expected for any phase of the development.

f) Completing the assessment

8.4.17. The ES to accompany the application for development consent will present a full amenity and recreation impact assessment underpinning the conclusions drawn above in relation to significant effects, confirm mitigation requirements and will account for any further design changes.

Table 8.4.1 Summary of effects for the construction and the removal and reinstatement phases

Amenity and recreation

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Users of amenity and recreation resources.	Changes to views, air quality and noise.	Retention of established vegetation. Measures to minimise noise and changes to air quality. A 3m high grassed earth storage and screening bund along the eastern and part of the southern boundaries.	Not significant.	None	Not significant.

Table 8.4.2 Summary of effects for the operational phase

Amenity and recreation

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Users of amenity and recreation resources.	Changes to views, air quality and noise.	Retention of established vegetation. Screening through planting and bunding. Measures to minimise noise and changes to air quality.	Not significant.	None	Not significant.

8.5. Terrestrial historic environment

8.5.1. The figure for terrestrial historic environment is presented in **Volume 3** as **Figure 8.5.1**.

a) Baseline environment

8.5.2. An archaeological Desk Based Assessment (DBA) was undertaken for the Darsham park and ride site in 2014. The DBA considered existing records of archaeological features and investigations as well as historic mapping, aerial photography and documentary sources. Searches of Suffolk Historic Environment Record (HER), Historic England's Archives Monuments Information England, and the National Heritage List for England were undertaken.

8.5.3. The site boundary was amended after the 2014 DBA. As a result, new searches of the above datasets were undertaken in August 2018, and the DBA was updated in Autumn 2018. A study area of 1km from the revised site boundary was used.

8.5.4. Geophysical survey of the original site was undertaken in 2016 and a programme of trial trenching has been designed in consultation with Suffolk County Council (SCC) Archaeological Services. These will both be expanded to include the additional site area proposed at Stage 3. Trenching will be carried out to characterise potential archaeological features identified through the DBA and the geophysical survey.

8.5.5. There are no designated assets within the site boundary. There are nine listed buildings within the study area, all of which are listed at Grade II. These include Oak Hall (LB 1030664), which lies 60m to the north of the site boundary. Two ancient woodlands with earthworks are recorded within the 1km study area. There is ancient woodland at Sillet's Wood 350m north-west of the site, as well as a pocket of Ancient Replanted Woodland at the western edge of the study area.

8.5.6. No previously recorded heritage assets have been identified within the site boundary. Thirty-one non-designated HERs are known within the 1km study area, ranging from prehistoric findspots to a Second World War (WWII) radar station.

8.5.7. The DBA noted the potential for as yet unrecorded heritage assets to be present within the site boundary. This conclusion appears to have been borne out by subsequent geophysical survey and effects on these potential remains are considered below.

8.5.8. Hedges which could be considered important under the Hedgerow Regulations 1997 (Ref. 8.5.1) are present along the site boundaries to the north and to the east (Willow Marsh Lane and the A12, respectively) and behind the houses at Whitehouse Farm and Moat Hall. These hedgerows are located on boundaries shown on the 1803 estate map and the 1843 Tithe Map. These hedges are considered to be of low significance as relict elements of the historic landscape.

8.5.9. The HER includes 13 records of previous archaeological investigations undertaken across the study area including geophysical survey, trial trench evaluation and the archaeological monitoring of construction works.

i) Prehistoric

8.5.10. There are no HERs dating from the prehistoric period within the site boundary. Two Neolithic find spots, a flint axe found near Priory Farm (MSF1937) to the north, and flint flakes found in a field 950m south of the site (MSF1943), are recorded within the study area. Late Bronze Age/early Iron Age pottery and flint were found near Station Garage (MSF26570). A single Iron Age artefact, a weaving comb made of deer antler (MSF2055), is recorded within the study area.

8.5.11. A particular feature of late Iron Age settlement in east Suffolk is the preference for relatively high ground, on spurs, overlooking valleys similar to that occupied by this site.

8.5.12. There is the potential for prehistoric remains to be present within the site, though the nature of any such remains cannot be established at this stage. Further archaeological investigation will provide a more detailed understanding of this potential.

ii) Romano-British period

8.5.13. There are no known Roman remains or activity from this period within or adjacent to the site. Romano-British features, including two cremation pits, were uncovered during trial trench evaluation at Land West of Mill House, The Street, Darsham (MSF28545), 600m east of the site. A 3rd century coin (MSF17244) a *sestertius* of Maximus I (AD 235-238) was found during metal detecting in a field 400m to the south of the site.

8.5.14. Geophysical survey did not suggest any specific evidence for remains of this date within the site, though this possibility cannot be ruled out. Further archaeological investigation will allow for a clearer understanding of this potential.

iii) Early-medieval and medieval

8.5.15. There are no recorded early-medieval remains within the site.

8.5.16. The name of Darsham has its origins in the early-medieval period and is believed to derive from 'Deores Ham' – 'home of the deer' or the personal name 'Deor's Meadow'. This name is borne out by early reference to local roadways as chaseways, and the large parkland documented on historic maps at the Old Hall. Darsham Hall is thought to have been built in the 15th century and is now a farmhouse (MSF14934). Further medieval finds have been recorded within the area of Darsham Old Hall and associated park immediately adjacent to the site across the A12. A metal-detector findspot of an early-medieval small-long type brooch (MSF17245) is recorded 300m south of the site.

8.5.17. There are no recorded medieval remains within the site. Archaeological evaluation on the eastern side of the A12 (ESF21639), between Railway Cottage and Station Garage, identified a number of medieval features believed to relate to a nearby settlement. A former moat dating to the medieval period (MSF1936), is located immediately outside the eastern site boundary.

8.5.18. The Suffolk Historic Land Characterisation (HLC) project identifies the area as 'Pre-18th century enclosure – long co-axial fields', which may have had an origin in the medieval period. These boundaries are first shown on Peak's 1803 map, although the majority of these boundaries have been removed during the 20th century. The geophysical survey identified linear anomalies, aligned east-west across the site, which are likely to represent the remains of headland features or boundary ditches, illustrated on the 1803 estate map.

8.5.19. It is not anticipated that there would be significant medieval remains within the site, although elements of dispersed farmsteads or industrial sites may be present. Further archaeological investigation will allow for a more detailed understanding of this potential.

iv) Post-Medieval

8.5.20. The modern A12 follows the line of the Ipswich – Lowestoft turnpike road which was established during the late-18th century; a post-medieval milestone is recorded along the A12 (MSF28542).

8.5.21. The East Suffolk line (MSF34987) passes through the eastern part of the study area, with Darsham Railway station being built in 1859 (MSF28543).

8.5.22. The Grade II Listed lodge (LB 1200647) at Cockfield Hall, dates from the early 19th century, and is located approximately 800m south-west of the site. Other post-medieval records within the study area include Darsham Methodist Chapel (MSF27649) built in 1873, situated c. 550m east of the site, whilst further afield, the likely location of a bridge spanning the River Yox (MSF16882) shown on a 1783 map is recorded. A scatter of post-medieval artefacts (MSF27306), found 150m to the east of the site within the lands at Darsham Old Hall, comprised an alloy purse bar, 27 Elizabeth I coins and a copper alloy 'sphere'.

8.5.23. It is not anticipated that there would be significant remains of this date present within the site.

v) Modern period

8.5.24. The modern period experienced a general continuity of settlement and agricultural land use from the post-medieval period.

8.5.25. There are two HERs of modern features within the study area, a house constructed of two railway carriages (MSF22622) and the former RAF High Street Chain Home radar station (MSF26343).

8.5.26. It is unlikely that there are further, as yet unknown remains dating to the modern period within the site boundary.

vi) Undated

8.5.27. Geophysical survey, combined with historic map regression, suggests that buried archaeological remains of pre-modern origin are likely to be encountered within the site.

8.5.28. A cluster of geophysical anomalies located within the south-eastern corner of the site close to the former moat, may be of archaeological interest.

vii) Modern disturbance

8.5.29. It is likely that the construction of the railway and Darsham station would have disturbed any buried archaeological remains located along the westernmost boundary of the site.

8.5.30. Construction of the modern A12, and buildings outside the eastern boundary, may have impacted any buried archaeological remains located within the easternmost part of the site.

8.5.31. Arable cultivation during the 20th century is likely to have disturbed the upper layers of any buried archaeology. Repeated ploughing, particularly subsoil ploughing, can be expected to have disturbed near surface features. More substantial features, such as ditches and pits, are likely to be relatively well-preserved, particularly in any areas of meadow or permanent pasture. It is also possible for ploughing and natural processes to result in the development of colluvial deposits, which may preserve earlier features.

8.5.32. Many of the former field boundaries within the site have been removed and infilled, although some are visible either as soil marks on aerial photographs or as magnetic anomalies within the geophysical surveys.

b) Environmental design and embedded mitigation

8.5.33. Change to setting arising from the proposed park and ride facility could give rise to loss of or harm to heritage significance. Detailed design will seek to minimise perceptual change, for example, lighting will be designed to minimise light spill.

8.5.34. As part of the embedded environmental mitigation measures, the surviving hedges will be, in the main, retained and maintained for the duration of the park and ride use. There will be subsequent restoration of any sections of hedgerow that were removed during construction.

c) Preliminary assessment of effects

i) Construction

8.5.35. Intrusive groundworks would take place across the site, including topsoil stripping and sub-soil disturbance during construction. Invasive works of this nature would adversely affect any surviving sub-surface archaeological remains, reducing or removing their ability to be further interpreted, resulting in the loss of archaeological interest.

8.5.36. DBA and geophysical survey has suggested the presence of previously unrecorded archaeological remains that are likely to be of low to moderate significance. Planned trial trenching will confirm the presence or absence of archaeological remains and enable this potential to be understood. Any archaeological remains within the proposed site would be substantially disturbed, if not removed entirely, by the proposed park and ride facility. This would give rise to a large magnitude of change which could, in the absence of further mitigation, be significant.

8.5.37. The historic hedges along the site boundary should be considered of low significance as relict elements of the historic landscape. Given the embedded mitigation measures, the change to the important hedgerows is considered to be very low, with a resulting negligible effect, which would be not significant.

8.5.38. Construction activities could potentially affect the settings of designated heritage assets in the vicinity of the proposed site. An initial study has been undertaken to identify designated assets that have the potential to be affected by the proposed park and ride facility in accordance with Step 1 of the Historic England guidance (Good Practice Advice in Planning Note 3) (Ref. 8.5.2); full assessment will be presented to support the application for development consent.

8.5.39. Change to setting is considered here as a primarily operational effect, in that any lasting change would be discernible during the operation of the proposed park and ride facility. Any increase in the magnitude of change during the construction programme over that experienced during the operation period would be limited, as the proposed construction programme is anticipated to be of short duration.

ii) Operation

8.5.40. Disturbance of any archaeological remains within the site would have occurred, and been effectively mitigated, during construction. Therefore, no direct effects on heritage assets are anticipated during the operation of the proposed park and ride site.

8.5.41. Listed buildings within the study area would not be affected by the proposed park and ride facility. The setting of these assets is defined by their relationship to adjacent buildings and agricultural land. Any perceptual change will be insufficient to give rise to adverse effects given the distance of the assets from the site and the existing A12.

8.5.42. The non-designated parkland at Cockfield Hall is of medium significance for historic and architectural interests. It represents a surviving example of a designed landscape, which has been progressively altered to reflect fashion, utility and changing historical circumstances, from the 16th century to the present. This area is contained within strong woodland planting which separates it from the surrounding countryside, the A12 and the village of Yoxford. Visibility of the proposed park and ride facility would be limited, and the agricultural land between the parkland and the site would serve as a perceptual buffer. Consequently, any change in the setting of the asset would be of very low magnitude, giving rise to a minor effect which would be not significant.

iii) Removal and reinstatement

8.5.43. Any disturbance of archaeological remains within the site would have occurred and been effectively mitigated during construction. Therefore, no direct effects are anticipated during this phase. The removal of the proposed park and ride facility, and the restoration of the site to agricultural use, would effectively reverse any perceptual change in the historic landscape and setting of heritage assets.

b) Additional mitigation and monitoring

8.5.44. Additional mitigation of direct effects on heritage assets would comprise the adoption of an agreed written scheme of archaeological investigation to ensure that the archaeological interest of any significant deposits and features could be appropriately investigated, recorded and disseminated. This would ensure that the effect on buried archaeological remains from the proposed park and ride facility could be adequately mitigated.

8.5.45. A suitable mitigation strategy will be agreed with Suffolk County Council Archaeology Service (SCCAS) once all archaeological fieldwork has been completed and the results are known. Monitoring of the agreed programme of archaeological investigation would be carried out by SCCAS during the implementation of the scheme. Publication and popular dissemination of the results would allow any informative and historic value to be fully realised.

8.5.46. A settings assessment, which will be consulted on with HER and Suffolk Coastal District Council's (SCDC) Conservation Officer, ahead of application for development consent will be undertaken. It will consider heritage assets where setting may potentially be subject to effects, their current setting, the potential change, and the magnitude of effect the proposed park and ride facility may have on their setting. Any mitigation required will also be consulted upon and will most likely comprise screening and landscaping.

c) Preliminary assessment of residual effects

8.5.47. The loss of archaeological interest through disturbance of archaeological remains within the site could have a significant adverse effect. However, following the implementation of an agreed scheme of archaeological investigation any residual effect is not expected to be significant.

8.5.48. No significant adverse effects arising from change to setting of heritage assets are anticipated.

d) Completing the assessment

8.5.49. A full archaeological assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant direct effects, and would draw upon LVIA, noise, air quality and other assessments where appropriate.

8.5.50. In advance of construction field evaluation would be undertaken and this would include geophysical survey and trial trenching, the scope and extent of which would be agreed with SCCAS.

8.5.51. Once the intrusive archaeological investigation (trial trenching) is complete, an appropriate mitigation scheme for buried archaeological remains, if present, would be agreed with SCCAS.

Table 8.5.1 Summary of effects for the construction phase

Terrestrial historic environment

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Previously unrecorded archaeological remains.	Disturbance or removal as a result of topsoil stripping and subsoil disturbance.	None	Significant	Agreed written scheme of archaeological investigation to ensure that the archaeological interest of any significant deposits and features could be appropriately investigated, recorded and disseminated.	Not significant.
Historic Hedgerows.	Loss due to construction activities/location of site.	Retain where possible.	Not significant.	None	Not significant.

Table 8.5.2 Summary of effects for the operational phase

Terrestrial historic environment

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Non-designated parkland at Cockfield Hall.	Change in setting due to proximity to park and ride site.	None	Not significant.	None	Not significant.

Table 8.5.3 Designated heritage assets within study area

Historic England list entry	Name	Grade	Easting	Northing
1030627	The Gables	II	640022	269084
1030664	Oak Hall	II	641190	270860
1030680	Stone Cottage	II	641497	271493
198815	Old Hall	II	641074	269609
1200577	Coach House and Barn Cockfield Hall	II	639644	269197
1200647	Cockfield Hall Lodge	II	639973	269088
1377216	Trustans Farmhouse	II	640896	269206
1377235	Gateway immediately south-sast of Coach House and Barn, Cockfield Hall (including adjoining L-shaped section of walling to south-east)	II	639656	269181
1377254	Hill Farmhouse	II	641542	271082

8.6. Soils and agriculture

8.6.1. The figures for soils and agriculture are presented in **Volume 3** as **Figures 8.6.1** to **8.6.4**.

a) Baseline environment

8.6.2. The site is underlain by an area mapped as the Crag Group (quaternary sand), with an overlying drift deposit of glacial outwash of the Lowestoft Formation (Ref. 8.6.1).

8.6.3. The soils on the site are slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils (**Figure 8.6.1**). Drainage is impeded, with land covered by such soils generally being under grass or arable production (Ref. 8.6.2).

8.6.4. Published Agricultural Land Classification (ALC) maps (Ref. 8.6.3) show the site to be Grade 3, with Grade 2 land in the most southern part of the site (**Figure 8.6.2**).

8.6.5. Under the ALC system land is graded between Grade 1 and 5, with Grade 3 subdivided into 3a and 3b. Land in Grades 1, 2 and 3a is considered to be 'best and most versatile' land.

8.6.6. As no detailed ALC mapping was available for this site a detailed ALC survey was undertaken across the southern part of the site (covering approximately 14ha) in August 2016. This found agricultural land in Grades 3a (8.23ha) and 3b (4.60ha), with a small area (1.17ha) of non-agricultural land. The remaining land (to the north) which has not been surveyed in detail is mapped just as Grades 2 or 3, based on available provisional ALC mapping.

8.6.7. These areas, and the corresponding percentages, are shown in **Table 8.6.1**.

Table 8.6.1 Agricultural Land Classification grade distribution

ALC Grade	Area (ha)
2	8.03
Grade 3 (undifferentiated)*	21.05
Total	**29.09**

*Based on available provisional ALC maps, of which at least 8.23ha is Grade 3a

8.6.8. Soil texture, from the field survey undertaken, is generally relatively heavy, comprising medium to heavy clay loams and clays. These soils will therefore become waterlogged at times and be slow to dry out, and thus can be difficult to handle when in a plastic state. This relates to the water content at which a soil can be easily deformed, resulting in a risk of a loss of soil structure and a degradation of soil quality during handling. On the basis of soil texture, the area provisionally mapped as Grade 3 which has not yet been surveyed in detail is considered unlikely to be higher than Sub-grade 3a.

8.6.9. Currently available information shows that at least 8.23ha of the site will comprise best and most versatile land (i.e. Grades 1, 2 and 3a). Of the un-surveyed land it is likely that a proportion of this will also be best and most versatile land.

8.6.10. At the time of the ALC survey the site, except for the southern tip, was under arable production, comprising wheat which had been harvested across part of the field with some areas of fallow.

8.6.11. A landowner interview confirmed that the site comprises approximately 8% of a wider arable land holding. Cropping is typically arable (cereals) crops with beans and sugar beet as additional break crops. This crop rotation is managed across the farm's arable land.

8.6.12. The site does not have access to irrigation water and is not serviced by drinking troughs. Field drains outfall to the west along the railway line. In addition, a buried drain takes storm water from the farm buildings and yard under the site.

8.6.13. The farm buildings near to the site comprise a satellite yard and include a 600-tonne grain store. Contractors are used for arable spraying and combine harvesting in conjunction with the farm's single full-time employee.

8.6.14. Shooting rights are retained by the farm (periphery drive twice a year) for the owners own amenity rather than commercially.

8.6.15. The site has hedges, ditches and field corners managed under Entry Level Stewardship (**Figure 8.6.3**). It is not Organic accredited. None of the land is under a Woodland Grant Scheme (**Figure 8.6.4**).

b) Environmental design and embedded mitigation

8.6.16. A summary of the measures that have been incorporated into the design of the proposed park and ride facility and that would protect the existing features of soil and agricultural interest is set out below.

i) Construction

8.6.17. The sustainable re-use of the soil resource will be undertaken in line with the CEMP for the Sustainable Use of Soil on Construction Sites (Ref. 8.6.4). This will be achieved by the development of a Soil Management Plan (SMP) identifying the soils present, proposed storage locations and handling methods and how the resource will be re-used. The SMP will form part of the CEMP. Measures which will be implemented include (but are not limited to):

- completion of a Soil Resources Survey and incorporate results into a SMP;
- link the SMP to the Site Waste Management Plan (SWMP);
- ensure soils are stripped and handled in the driest condition possible;
- confine vehicle movements to defined haul routes until all the soil resource has been stripped;
- protect stockpiles from erosion and tracking over; and
- ensure physical condition of the entire replaced soil profile is sufficient for the post-construction use.

8.6.18. All soils would be stored away from watercourses (or potential pathways to watercourses) and any potentially contaminated soil would be stored on an impermeable surface and covered to reduce leachate generation and ultimately disposed of at a licensed facility.

8.6.19. Industry standard measures would be put in place to control pollution, including from fuel or chemical stores, silt-laden run-off or dust.

8.6.20. A considerate construction approach would be used to minimise potential impacts on the remainder of the landholding and on neighbouring landholdings during the construction phase. Toolbox talks would be used to inform all those working on the site of the requirements for soil handling and minimisation of disturbance to agricultural activities.

8.6.21. All fencing around the proposed development would be sufficient to resist damage by livestock and will be regularly checked and maintained in a suitable condition. Any damage to boundary fencing would be repaired immediately.

8.6.22. Measures contained in relevant Department for Environment, Food and Rural Affairs (Defra) and Environment Agency best practice guidance (Ref. 8.6.5) on the control and removal of invasive weed species would be implemented where appropriate.

8.6.23. Works would cease, and the Animal Health Regional Office would be advised, should animal bones be discovered which indicate a potential burial site.

8.6.24. All movement of plant and vehicles between fields would cease in the event of a disease outbreak and official Defra advice would be followed to minimise the biosecurity risk associated with the continuation of works.

8.6.25. EDF Energy would liaise with landowners in relation to temporary and permanent land take requirements to understand and where possible address their concerns.

ii) Operation

8.6.26. The measures described for the construction phase would be maintained throughout the operational phase, as appropriate.

iii) Removal and reinstatement

8.6.27. Following completion of construction operations all agricultural land taken temporarily would be fully reinstated as near as practically possible to its former condition. Topsoil would be prepared and seeded using an appropriate seed mix or returned immediately to cultivation depending on the time of year. Permanent surface water/agricultural drains would be re-installed to reinstate any pre-existing field drainage systems to pre-construction condition.

c) Preliminary assessment of effects

8.6.28. The potential for significant effects on soils and agriculture is discussed in this section. The assessment of significance is based on the embedded mitigation measures outlined above being in place.

i) Construction

8.6.29. The proposals for this site would result in the temporary loss of approximately 29ha of land from primary agricultural productivity for approximately ten years. At least 8.23ha of this land is known to comprise best and most versatile (Grade 3a). There is the potential for further parts of the site to also be best and most versatile land.

8.6.30. Given the potential extent of best and most versatile land to be lost on a temporary basis this preliminary assessment considers that this would be a temporary, significant adverse effect.

8.6.31. There would also be an impact on the agricultural enterprise because of the loss of a proportion of the productive land. This would be assessed on a case by case basis as required.

8.6.32. On the assumption that landowners' concerns are addressed, through appropriate mitigation, this preliminary environmental assessment considers that significant effects on the agricultural enterprise are unlikely to occur and so are not considered further.

ii) Operation

8.6.33. There would be no additional operational phase effects on the soil resource or agricultural enterprise.

iii) Removal and reinstatement

8.6.34. The buildings and associated infrastructure would be removed in accordance with a demolition plan, which would maximise the potential for re-use of building, modules and materials.

8.6.35. The area will then be returned to its existing use, excluding the roundabout, using a methodology which will be defined in a restoration plan.

d) Additional mitigation and monitoring

8.6.36. There are no mitigation measures available for the loss of best and most versatile land. The effect would however be temporary, and the land would be returned to agricultural use post-operation.

e) Preliminary assessment of residual effects

8.6.37. The embedded mitigation measures would ensure that the potential for significant adverse effects is removed with the exception of the loss of agricultural land for approximately ten years.

f) Completing the assessment

8.6.38. Once the proposals for the development as a whole are finalised, a full assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects. An ALC survey would be undertaken across the part of the site which has not been surveyed to fully inform the assessment of impacts. In addition, the landowner interview would be repeated to identify any changes in the operation of the agricultural business.

Table 8.6.2 Summary of effects for the construction phase

Soils and agriculture

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Agricultural land.	Temporary loss of approximately 29ha of which at least 8.23ha is best and most versatile land.	The sustainable re-use of the soil resource will be undertaken in line with the Construction Environmental Management Plan for the Sustainable Use of Soil on Construction Sites.	Significant but temporary.	There are no additional mitigation measures available.	Significant but temporary.
Agricultural businesses.	Temporary impact due to the loss of a proportion of the productive land.	EDF Energy will liaise with landowners to understand and address their concerns.	Not significant.	Additional mitigation measures are therefore not required.	Not significant.

Table 8.6.3 Summary of effects for the operational phase and removal and restoration

Soils and agriculture

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Agricultural land.	There are no impacts identified during the operational phase.				
Agricultural businesses.	There are no impacts identified during the operational phase.				

8.7. Noise and vibration

8.7.1. The figures for noise and vibration are presented in **Volume 3** as **Figures 8.7.1** and **8.7.2**.

a) Baseline environment

8.7.2. Baseline noise levels have been determined by surveys and modelling road traffic noise. Noise survey work has also been carried out at three nearby representative locations during the school holidays; at one location, (PRN1, Willow Marsh Cottage), an additional check was carried out during school term time. A summary of the baseline survey data is provided in **Table 8.7.1**. Monitoring locations are shown in **Figure 8.7.1**.

8.7.3. The principal source of noise in the area is from road traffic on the A12. There are noise sensitive premises facing the A12, on the eastern boundary of the site. In the north-western corner of the site, off Willow Marsh Lane, there is a single premise (PRN1) which is considerably further from the A12 and therefore exposed to lower levels of road traffic noise.

8.7.4. Baseline noise levels at surrounding noise sensitive premises have been informed by the survey, but determined primarily by modelling baseline road traffic noise. A plan showing the groups of receptors is shown in **Figure 8.7.2**. Receptors are coded A to D on this plan. Modelled baseline noise levels at these locations are as shown in **Table 8.7.2**.

Table 8.7.1 Baseline survey data

Location code	Location name	Period	Typical measured level, decibels (dB)		
			L_{Aeq}	L_{A90}	L_{Amax}
PRN1A	Willow Marsh Cottage (School Holidays).	07:00-19:00	55	37	90
		19:00-23:00	50	34	85
		23:00-07:00	43	32	80
PRN1B	Willow Marsh Cottage (Term Time).	07:00-19:00	55	32	80
PRN2	Willow Marsh Lane/A12 Junction.	07:00-19:00	60	45	93
		19:00-23:00	56	40	80
		23:00-07:00	48	18	72
PRN3	Darsham	07:00-19:00	74	56	100
		19:00-23:00	70	35	86
		23:00-07:00	62	29	90

Table 8.7.2 Key receptors

Receptor	Existing level, $L_{Aeq,}$ dB	
	Day	Night
A	54	48
B	62	56
C	65	59
D	49	44

b) Environmental design and embedded mitigation

i) Construction

8.7.5. The standard of good practice outlined in BS 5228-1 (Ref. 8.7.1) would be followed. Primary mitigation for the control of noise and vibration could therefore include, but not be restricted to the following measures:

- landscaping (early establishment of the earth bunds which would provide an effective noise screen);
- selection of quiet plant and techniques in accordance with good practice in BS5228 for all construction, demolition and earth moving activities;
- selection of mechanical services (such as air conditioning condenser units and air handling units) which would ensure that limit values will be met;
- switching off equipment when not required;
- use of reversing alarms that ensure proper warning whilst minimising noise impacts off-site; and
- provision of training and instruction to construction site staff on methods and techniques of working to minimise off-site noise and vibration impacts.

8.7.6. BS 5228-2 gives detailed advice on standard good practice for minimising impacts from construction vibration. It is expected that this would be set out in the CEMP and that it would be a requirement of the contractors to adhere to this.

8.7.7. EDF Energy would have a system for the receipt and recording of any noise or vibration complaints from occupiers of noise sensitive receptors, and procedures for investigating as necessary upon those complaints.

ii) Operation

8.7.8. The site layout would incorporate earth bunds and this would provide some sound level reduction to operational activities on-site; an initial assessment of likely noise impacts has been undertaken based on the proposed layout and assumed height of 3m.

c) Preliminary assessment of effects

8.7.9. Noise and vibration levels have been predicted by calculation and modelling. A "significant" effect has been identified where levels are predicted to exceed a specified threshold value. Appropriate threshold levels are based on various standards and a relevant guidance and depend on the type of source; the sensitivity of the receptors; the time of day when it might occur; and, in some situations, on the existing noise levels in the area.

i) Construction

8.7.10. The formation of an earth bund would be undertaken early in the construction programme, following the site preparation works. This would provide a level of sound reduction for following construction stages as well as during operation of the park and ride. Predictions of construction sound levels at noise sensitive receptors from the phases that follow the formation of the bund therefore take account of the presence of a 3m high bund.

8.7.11. An assessment of the magnitude of noise impact was carried out on a preliminary site layout with a different site access to that currently proposed and all effects were found to be below a significant level for all receptors except for those on the eastern side of the A12 during the construction, and the removal and reinstatement phases. It is expected that similar noise levels would be predicted for the proposed site layout when this is reassessed. During these phases, it is predicted that the effects would be significant when construction activity takes place close to the site boundary with the A12. During earlier phases of construction, although noise levels would not be above a significant threshold, some additional noise level reduction would be desirable for construction activity close to the A12, as far as reasonably possible.

8.7.12. Given the distances to the receptors from the main working areas during the construction phases, and the existing environmental conditions described, it is predicted that there would be no significant vibration effect.

ii) Operation

8.7.13. Noise levels are predicted to be below the threshold for the lowest observable effect and would therefore be negligible. Vibration effects from the operational phase would also be negligible.

iii) Removal and reinstatement

8.7.14. During the removal and reinstatement phase, the effects will be similar to those during construction. Once the landscape works are complete and the site restored to its existing agricultural use, there would be no potential for further adverse noise effects.

d) Additional mitigation and monitoring

i) Construction and removal and reinstatement

8.7.15. No additional mitigation would be required during these phases to mitigate significant adverse effects.

ii) Operation

8.7.16. No additional noise mitigation is likely to be required to mitigate operational noise effects.

iii) Monitoring

8.7.17. Routine monitoring would be carried out to a scheme to be agreed with local authorities. Provision would be made as necessary for monitoring of noise and vibration levels in the event of complaints being received from occupiers of noise sensitive receptors, or on request of the local authorities.

e) Preliminary assessment of residual effects

8.7.18. No residual significant effects are predicted during the construction, operation or removal and reinstatement phases.

f) Completing the assessment

8.7.19. Further assessment of impacts will be needed. In particular, the further consideration of the construction methodology, local topographical features and layouts, and required mitigation. The ES will present a full noise and vibration assessment of the revised layout and will consider any new information such as amended design or construction methodologies which might be relevant, although it is anticipated that the assessment will support the preliminary conclusions drawn above.

Table 8.7.3 Summary of effects for the construction and removal and reinstatement phases

Noise and vibration

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
All receptors.	Noise and vibration impacts.	Selection of plant and methodology in accordance with good practice, including bunding.	Not significant.	None	Not significant.

Table 8.7.4 Summary of effects for the operational phase

Noise and vibration

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
All receptors.	Noise and vibration from operation of main development site.	Bunding	Not significant.	None	Not significant.

8.8. Air quality

a) Baseline environment

8.8.1. The human receptors to the proposed park and ride facility are Moat Hall, Darsham Cottage and White House Farm located on the A12 adjacent to the proposed site boundary.

8.8.2. There are no sites of nature conservation interest (i.e. international, European and nationally designated ecosystem sites) within 350m[9] of the proposed park and ride facility site or routes used by construction traffic and therefore no designated sites are included in the construction phase air quality assessment for this facility (see also the **Terrestrial Ecology and Ornithology section 8.3**). The nearest site designation is Minsmere-Walberswick SPA/SSSI, but at approximately 3.5km away, this is unlikely to be affected by the proposed park and ride facility, so would be scoped out of consideration in the operational phase assessment.

8.8.3. SCDC has declared two Air Quality Management Areas (AQMAs) within its boundary (Ref. 8.8.1) due to elevated monitored concentrations of ambient Nitrogen Dioxide (NO_2), the nearest of which is approximately 10km from the site, along the A12 at Stratford St. Andrew. A third AQMA, at Dooley Inn, was revoked in 2016.

8.8.4. The nearest monitoring data (for a pollutant relevant to the assessment) is approximately 7.5km south at the NO_2 diffusion tube on Church Street, Saxmundham (Ref. 8.8.2), which in 2016 (the most recently reported year) monitored 32 micrograms per cubic metre ($\mu g/m^3$) which is below the annual mean air quality strategy objective of $40\mu g/m^3$ (Ref. 8.8.3). As NO_2 concentrations are generally more elevated in urban areas, concentrations at site are likely to be much lower than this, given the rural location.

8.8.5. Background concentrations of NO_2 and Particulate Matter of a diameter of 10 microns or below (PM10) in 2018 at the proposed park and ride facility were $7.1\mu g/m^3$ and $14.1\mu g/m^3$ respectively (Ref. 8.8.4), well below statutory objectives (Ref. 8.8.5, Ref. 8.8.6).

8.8.6. Dust levels are related to the action of wind on exposed soils and climatic conditions year to year, but existing levels are likely to be low given the arable nature of the existing land use.

8.8.7. Air quality is predicted to improve before 2027 because it is anticipated that improvements in vehicular emission rates and background concentrations will offset a general trend for an increase in vehicle numbers. Lower concentrations of road traffic-related pollutants may therefore be expected by the time the proposed park and ride facility is commenced. For example, NO_2 and PM_{10} 2027 background concentrations in the area are predicted at $5.5\mu g/m^3$ and $13.7\mu g/m^3$ respectively in 2027, a reduction in both pollutants.

8.8.8. No notable changes are expected in land use in the surrounding area and it is expected that rates of dust deposition are likely to be similar to current levels.

b) Environmental design and embedded mitigation

i) Construction

8.8.9. The following mitigation measures have been embedded into the construction of the proposed park and ride facility:

- site access located as far as practicable, and at least 10m, from receptors;
- concrete batching plant (if required) located as far as practicable from receptors; and
- mobile crushing and screening plant located as far as practicable from receptors.

8.8.10. Air quality impacts arising from the construction phase will be managed through a range of control measures detailed in a CEMP, supplemented by the measures appropriate to the level of risk designated to the proposed park and ride facility under Institute of Air Quality Management (IAQM) Guidance.

ii) Operation

8.8.11. The following mitigation measures have been embedded into the design and operation of the proposed park and ride facility:

- site access moved from the south, away from receptors, (as shown in Stage 2 consultation) to a new roundabout north of Willow Marsh Lane, based on stakeholder feedback received;
- buses used to transport construction workers are anticipated to have as high a European emissions standard as is reasonably practicable; and
- bus timetables to be optimised in order to reduce impact on local road network as far as practicable.

[9] The distance within which construction dust is likely to have an effect

8.8.12. The principal benefit of the proposed park and ride facility would be an overall reduction in main development site related traffic numbers, thus alleviating congestion, and associated emissions to air, within the residential areas close to the main development site.

iii) Removal and reinstatement

8.8.13. Mitigation applied to the construction phase is expected to be applied to the removal phase, as impacts are likely to be similar.

c) Preliminary assessment of effects

i) Construction

8.8.14. The potential impacts associated with the construction of the proposed park and ride facility include fugitive emissions of dust, emissions from non-road mobile machinery on the site, emissions from Heavy Goods Vehicles (HGVs) accessing the site and emissions from vehicles carrying workers to and from the site. However, given that the location is relatively remote from most receptors and the embedded mitigation measures described above, the adverse effects are likely to be negligible and would therefore not be significant for any of the proposed construction activities at the site.

8.8.15. The principal risk is anticipated to be related to earthworks, as this phase of construction can typically require a high volume of material to be moved. A high level of activity could potentially place the dust emissions category as 'Large' by IAQM classification (Ref. 8.8.7), with the likelihood of a 'Medium' risk based on the number and sensitivity of local receptors. Each risk category has the potential to lead to proportional adverse, albeit temporary, impacts which have the potential to be significant without mitigation.

8.8.16. However, assuming all mitigation measures are effectively implemented and monitored through an effective CEMP, at the level recommended by the dust risk assessment, no significant dust effects resulting from demolition and construction activities are anticipated.

8.8.17. It is expected that the number of Heavy Duty Vehicle (HDV)[10] movements required to develop the site would not exceed the IAQM screening threshold (Ref. 8.8.8) of more than 100 Annual Average Daily Traffic (AADT) required for a detailed dispersion modelling assessment and there would therefore not likely be a significant air quality effect.

ii) Operation

8.8.18. There is potential for increases in pollutant concentrations at receptors located along the local road network, particularly the A12 and Willow Marsh Lane, where there are increases in the numbers of vehicles using those roads. These would include up to 1,250 vehicles accessing the site to utilise the parking facilities and emissions from buses travelling between the site and the main development site.

8.8.19. Accordingly, IAQM guidance has been used to determine the necessity for an Air Quality Impact Assessment, and it is expected that the proposed park and ride facility would require a detailed assessment, given an anticipated HDV increase of approximately 100 AADT (dependant on strategy). However, as baseline concentrations across the study area are low, it is unlikely there would be significant air quality effects.

8.8.20. There are not anticipated to be any significant effects on AQMAs from the proposed park and ride facility, given their lack of proximity.

iii) Removal and reinstatement

8.8.21. The effects would be similar to the construction phase and so are likely to be negligible and would not be significant.

d) Additional mitigation and monitoring

8.8.22. No significant adverse effects are predicted for any phase of development and no additional mitigation measures are therefore proposed.

e) Preliminary assessment of residual effects

8.8.23. No significant adverse residual effects are predicted during the construction, operation or removal and reinstatement phases.

f) Completing the assessment

8.8.24. Once the proposals are finalised, the potential air quality effects of the proposed park and ride facility will be re-evaluated to confirm whether the preliminary conclusions presented above are applicable. The ES will present the full assessment considered necessary for the proposed park and ride facility, underpinning the conclusions drawn in relation to the absence of significant effects.

[10] HDVs include buses >3.5 tonnes in weight

Table 8.8.1 Summary of effects for the construction and removal and reinstatement phases

Air quality

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Construction dust					
Human	Potential generation of nuisance dust.	As recommended in CEMP and appropriate to level of risk identified by IAQM criteria.	Considered likely to be 'Medium', though not significant provided CEMP mitigation measures are adhered to.	None	Not significant.
Vehicle/NRMM emissions					
Human	Potential increase in emissions.	As recommended in CEMP.	Unlikely to meet IAQM screening criteria requiring assessment, and therefore not significant.	None	Not significant.

Table 8.8.2 Summary of effects for the operational phase

Air quality

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Vehicle emissions					
Human	Increased emissions at receptors.	Site access moved from the south, away from receptors, buses to have high European emissions standard, and bus timetables to be optimised.	Not likely to be significant.	None	Not significant.

8.9. Geology and land quality

a) Baseline environment

i) Geology

8.9.1. The following provides a summary of the geology and geological characteristics within the site and site vicinity:

- made ground: potentially present associated with the construction of the existing railway and road adjacent to the site and farmer's tips;
- superficial deposits: the Lowestoft Formation;
- bedrock: the Crag Group;
- important geological sites: none present;
- identified geological hazards: none present;
- mining, quarrying and natural cavities: none present;
- ground stability hazards: none present; and
- unexploded ordnance risks: low risk.

8.9.2. No exploratory holes have been recorded within 500m of the site.

ii) Hydrology and hydrogeology

8.9.3. The following provides a summary of the hydrological and hydrogeological characteristics within the site and site vicinity:

- surface water features: a pond is present on-site within the south-eastern section of the site and several additional ponds are present off-site within 500m of the eastern boundary. A drain and an unnamed watercourse are also present within the surrounding area;
- superficial aquifer: the Lowestoft Formation is classified as a Secondary (Undifferentiated) Aquifer;
- bedrock aquifer: the Crag Group is classified as a Principal Aquifer;
- groundwater vulnerability: predominantly soils of low leaching potential, with a small section in the south of the site underlain by soils of high leaching potential;
- groundwater/surface water abstractions: no licensed groundwater or surface water abstractions within 500m of the site;
- groundwater/surface water discharge consents: two licensed discharge consents to groundwater and five licensed discharge consents to surface water within 500m of the site for discharge of sewage from domestic properties and pumping stations. It is unknown whether these are currently active;
- pollution incidents: two significant pollution incidents within 500m of the site, but occurred more than 20 years previously so have not been considered further; and
- flood risk: predominantly very low risk, with low to high risk of flooding in the western extent of the site.

iii) Site history

8.9.4. The site currently supports agricultural land bound by the East Suffolk Railway line, Willow Marsh Lane and Main Road (A12) and this land use extends back into the 19th century at least. The areas surrounding the site have a similar history of land use with associated farmhouses including White House Farm located adjacent to the north-east site boundary. Darsham Railway Station is located adjacent to the south of the site and has been present since 1884. The area to the south of the site included two granaries and Darsham Service Station adjacent to site's south-eastern boundary. One of the granaries is labelled as 'Station Works' from 2012. The other granary and the service station are indicated on present day maps.

iv) Landfills and waste management sites

8.9.5. There are no historical or currently authorised landfills or waste management sites located within 500m of the site.

v) Previous investigations

8.9.6. There have been no previous ground investigations undertaken at the site.

vi) Key hazards

8.9.7. Key hazards present within the site vicinity include the following:

- made ground (on-site) associated with the construction of the A12 and Willow Marsh Lane;
- farmland (on-site) and the potential for un-mapped farmers tips;
- Darsham Service Station located 10m south-east of the site;

- Darsham Station and East Suffolk Railway Line situated adjacent to the site's southern boundary and forming the site's western boundary;
- granaries located adjacent to the south-eastern boundary of the site; and
- White House Farm: adjacent to the north-east site boundary.

vii) Summary of Preliminary Conceptual Site Model (PCSM)

8.9.8. A summary of potential contamination sources, pathways and receptors identified within the PCSM is provided in **Table 8.9.1**.

8.9.9. Potential receptors and pathways are shown in **Table 8.9.2**.

Table 8.9.1 Summary of Preliminary Conceptual Site Model

Potential source of contamination	Potential contamination	Approximate location
Made Ground associated with the construction of the A12 and Willow Marsh Lane.	Fuels and oils attributed to spills from vehicles on the roads included within the site boundary, plus exhaust particulates. A range of inorganic and organic contaminants including the potential for asbestos.	On-site.
Farmland within site boundary. Potential for un-mapped farmers tips.	Contamination risk from herbicides, pesticides, silage, effluent, and fuel oils. Risk of inorganic and organic contamination including metals and hydrocarbons, polychlorinated biphenyls (PCBs), asbestos, etc.	
Darsham Service Station 10m south-east of the south-east boundary.	Inorganic and organic contaminants including metals, petroleum, petrol additives, diesel, oils/lubricants.	Off-site.
Darsham Station and station works, adjacent to southern boundary and the East Suffolk line forming the west boundary.	A range of inorganic and organic contaminants including hydrocarbons, PCBs, Polycyclic aromatic hydrocarbons (PAH), PAHs, solvents and creosote; metals; and ash and fill used in the construction of the railway.	
Granaries located adjacent to the south-eastern boundary of the site.	Risk of inorganic and organic contamination including metals and hydrocarbons, asbestos, etc.	
White House Farm adjacent to the north-east boundary.	Metals, fuels, oils and pesticides associated with various farming practices.	

Table 8.9.2 Potential receptors and pathways

Receptor Group	Receptor	Principal Contaminant Migration pathways
Human health (on-site).	Construction/maintenance workers. Users of the new park and ride site. Residents in adjacent properties/users of adjacent commercial premises.	Dermal contact with and ingestion of contaminants in soils, soil-derived dusts and water; and Inhalation of soil-derived dust, fibres, gas and vapours.
Human health (off-site).	Pedestrians accessing surrounding roads. Farmers and workers on agricultural land. Groundwater in Principal Bedrock Aquifer. Groundwater in Secondary Undifferentiated Superficial Aquifer.	Dermal contact with and ingestion of contaminants in soil-derived dusts and water that may have migrated off-site; and Inhalation of soil-derived dust, fibres, gas and vapours which may have migrated off-site.
Controlled waters: groundwater (on-site and off-site).	Pond on-site (to be retained during construction and operation).	Leaching of contaminants in soil to groundwater in underlying aquifers; and Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.
Controlled waters: surface waters (on-site and off-site).	Drain and unnamed watercourse in surrounding area and ponds within 500m of the site. Existing on-site services and structures on-site and off-site. Proposed on-site services and structures.	Lateral migration of contaminated groundwater with discharge to surface watercourses as base flow; and Discharge of contaminants entrained in groundwater and/or surface water run-off followed by overland flow and discharge.
Property (on-site and off-site).	Crops and livestock.	Direct contact of contaminants in soil and/or groundwater with existing and proposed structures and buried services and migration of contaminated groundwater, ground gas and/or vapours along strata and preferential pathways such as service routes or differentially permeable strata. Direct contact, ingestion, inhalation and uptake of soil and water contamination by crops and/or livestock and migration of contaminated waters/ dust/fibres and subsequent uptake by crops or ingestion/inhalation/dermal contact by livestock.

b) Environmental design and embedded mitigation

i) Construction

8.9.10. A summary of the measures that have been incorporated into the design of the proposed park and ride facility and that would protect land quality during construction is set out below:

- A piling risk assessment in accordance with Environment Agency guidance may be required to ensure that piling techniques deemed appropriate are implemented at the site by identifying and managing potential risks as a result of creating pathways to the aquifer.
- The CEMP would specify measures required including the following:
  - minimising the area and duration of soil exposure and timely reinstatement of vegetation or hardstanding to prevent soil erosion and reduce temporary effects on soil compaction;
  - stockpile management (such as water spraying and avoiding over stockpiling to reduce compaction of soil

and loss of integrity) to prevent windblown dust and surface water run-off;
  - implementation of appropriate dust suppression measures to prevent migration of contaminated dust;
  - implementation of working methods during construction to ensure that there is no surface water run-off from the works or any stockpiles into adjacent surface watercourses/leaching into underlying groundwater in accordance with best practice;
  - implementation of appropriate pollution incident control e.g. plant drip trays and spill kits;
  - implementation of appropriate and safe storage of fuel, oils and equipment during construction;
  - implementation of an appropriate Materials Management Plan (MMP) to document how the excavated materials will be dealt with and a verification plan to record the placement of materials at the site; and
  - implementation of a SWMP.

- Remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) would be undertaken if further investigation and risk assessments deem necessary.

- Gas protection measures would be incorporated within proposed structures, if monitoring and risk assessments deem them to be necessary.

- Hydroseeding of the earth bunds would be used to reduce soil erosion and dust.

- Design of the road and car parking areas and the selection of construction materials would be in accordance with good practice. The design would be required to take into account the ground conditions including the potential for ground movement, compaction, ground gas and ground aggressivity.

- Design of the swales and ponds would consider the ground conditions including the permeability of the strata and the level of contamination present on-site.

ii) Operation

8.9.11. A summary of the measures that would be incorporated into the operational phase of the proposed park and ride facility and that would protect land quality are set out below:

- The proposed park and ride facility would be operated in accordance with the relevant regulations and good practice and pollution prevention including:
  - the construction of hardstanding to avoid spills and leaks;
  - the incorporation of petrol/oil interceptors within the drainage design where considered necessary;
  - the use of appropriate SuDS schemes (see **Surface water section 8.11**); and
  - connection into the local foul water system or the use of a septic tank with all associated permits in place for foul water.

iii) Removal and reinstatement phase

8.9.12. A summary of the measures that have been incorporated into the removal and restoration phase of the proposed park and ride facility and that would protect the land quality is set out below:

- the use of a CEMP as detailed above to cover the removal of the park and ride infrastructure, the drainage infrastructure and the reinstatement of topsoil;

- implementation of a SWMP and removal of all wastes from site;

- use of a MMP to allow suitable materials to be placed back on-site; validation of the site and comparison against baseline conditions to assess the contamination status of the site following operation; and

- remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) if deemed necessary.

c) Preliminary assessment of effects

i) Construction

Ground contamination

8.9.13. The construction works could potentially introduce new sources of contamination and disturb any existing sources of contamination through excavation and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off and ground gas migration pathways. With the embedded mitigation measures in place, construction activities should not increase the contamination risks presented at the site and an overall neutral effect is predicted. These effects would not be significant.

8.9.14. A preliminary assessment of the effects during the construction phase is provided in **Table 8.9.3**:

Table 8.9.3 Summary of effects for the construction phase

Receptor	Value/Sensitivity	Baseline risk	Construction risk	Effect
Human	High	Very low.	Very low.	Not significant.
Controlled waters (groundwater).	Medium	Low	Very low.	Not significant.
Controlled waters (surface water).	Low	Low	Very low.	Not significant.
Property (existing and future structures and services).	Low	Very low.	Very low.	Not significant.
Property (crops and livestock).	Medium	Very low	Very low.	Not significant.

Physical effects

8.9.15. The development may also cause physical effects including changes in soil erosion associated with stripping of topsoil, vegetation clearance, stockpiling, earthworks and construction of the new infrastructure.

8.9.16. Earthworks including areas for temporary works are anticipated for the construction of the park and ride and topsoil would be stockpiled in bunds around the site. There is the potential for increased soil erosion and run-off with a high sediment load likely to impact local surface waters. Earthworks would be planned to minimise soil exposure as far as practicable and areas required for temporary works would be reinstated as soon as possible after they are no longer required. The stockpiles would be managed to prevent soil erosion and dust including spraying with water and hydroseeding. With embedded mitigation, the effects on soil erosion are considered to be temporary and neutral and would not be significant.

8.9.17. With the embedded mitigation, physical effects on land quality during construction are assessed to be to minor averse to neutral. These effects would not be significant.

ii) Operation

Ground contamination

8.9.18. The operation of the park and ride would potentially introduce new sources of contamination. Spillages and leaks may occur and below ground services could create additional potential pathways for the migration of potential contamination that were not present at baseline. With embedded mitigation, an overall neutral effect is anticipated. These effects would not be significant.

8.9.19. Effects during the operational phase are provided in **Table 8.9.4**.

Table 8.9.4 Summary of effects for the operational phase

Receptor	Value/Sensitivity	Baseline risk	Operation risk	Effect
Human	High	Very low.	Very low.	Not significant.
Controlled waters (groundwater).	Medium	Low	Very low.	Not significant.
Controlled waters (surface water).	Low	Very low.	Very low.	Not significant.
Property (existing and future structures and services).	Low	Very low.	Very low.	Not significant.
Property (crops and livestock).	Medium	Very low.	Very low.	Not significant.

Physical effects

8.9.20. Impacts in relation to physical effects including soil erosion, compaction and changes in ground stability would be mainly related to the construction phase of the development and there are not considered to be any significant effects during the operational phase.

iii) Removal and reinstatement phase

Ground contamination

8.9.21. The proposed park and ride facility would be removed and reinstated to the existing condition. With embedded mitigation incorporated into the design and effectively implemented during the construction and operation of the proposed park and ride facility, there would be an overall neutral effect. These effects would not be significant.

8.9.22. Effects during the removal and reinstatement phase are provided in **Table 8.9.5**.

Physical effects

8.9.23. Impacts in relation to physical effects will be mainly related to the construction phase of the development and there are not considered to be any significant effects during the removal and reinstatement.

d) Additional mitigation and monitoring

8.9.24. The preliminary assessment of effects presented above identifies no adverse significant effects during construction, operation or removal and restoration in relation to land quality. Additional measures to mitigate significant adverse effects are not therefore required.

e) Preliminary assessment of residual effects

8.9.25. No additional mitigation is proposed beyond the embedded measures described above and the residual effects for all phases of development would remain the same as those described above in the preliminary assessment of effects. The effects would be neutral or minor beneficial and would not be significant.

f) Completing the assessment

8.9.26. Once the proposals for the Sizewell C project as a whole are finalised, a full land quality assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 8.9.5 Summary of effects for the removal and reinstatement phase

Receptor	Value/Sensitivity	Baseline risk	Operation risk	Effect
Human	High	Very low.	Very low.	Not significant.
Controlled waters (groundwater).	Medium	Low	Very low.	Not significant.
Controlled waters (surface water).	Low	Very low.	Very low.	Not significant.
Property (existing and future structures and services).	Low	Very low.	Very low.	Not significant.
Property (crops and livestock).	Medium	Very low.	Very low.	Not significant.

Table 8.9.6 Summary of effects for the construction phase

Geology and land quality

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Ground contamination: current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Risk assessment to define risks and undertake remediation if required. The CEMP would include mitigation measures.	Not significant.	Not required.	Not significant.
Ground contamination: controlled waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant.		Not significant.
Ground contamination: property receptors (services/structures, crops and livestock).	Contamination from on-site sources.		Not significant.		Not significant.
Physical effects: ground conditions.	Soil erosion.		Not significant.		Not significant.

Table 8.9.7 Summary of effects for the operational phase

Geology and land quality

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Ground contamination: current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Construction methodology and associated mitigation measures would prevent impacts during operation. Facility operated in accordance with the relevant regulations and good practice.	Not significant.	Not required.	Not significant.
Ground contamination: controlled Waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant.		Not significant.
Ground contamination: property receptors (services/structures, crops and livestock).	Contamination from on-site sources.		Not significant.		Not significant.
Physical effects: ground conditions.	Soil erosion and impacts.		Not significant.		Not significant.

Table 8.9.8 Summary of effects for the removal and reinstatement phase

Geology and land quality

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Ground contamination: current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Incorporate mitigation measures into the CEMP. Validation of the site and remediation of soil/ groundwater contamination (if required).	Not significant.	Not required.	Not significant.
Ground contamination: controlled waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant.		Not significant.
Ground contamination: property receptors (services/structures, crops and livestock).	Contamination from on-site sources.		Not significant.		Not significant.
Physical effects: ground conditions.	Soil erosion and impacts.		Not significant.		Not significant.

8.10. Groundwater

a) Baseline environment

8.10.1. Details on the geology of the northern park and ride site are provided in the **Geology and land quality section 8.9**.

8.10.2. The head deposits and the diamicton of the Lowestoft Formation are classified as Secondary Aquifers (Undifferentiated)[11] (Ref. 8.10.1).

8.10.3. The Crag Group bedrock underlying the site is classified as a Principal Aquifer[12].

8.10.4. There are no groundwater Source Protection Zones (SPZ)[13] within 1km of the site.

8.10.5. Contours shown on British Geological Survey (BGS) hydrogeological mapping (Ref. 8.10.2) suggest that Crag groundwater levels at the site are be around 7m above Ordnance Datum (AOD) (approximately 20m below ground level). These contours are based on data from 1976 and are only indicative of current levels, however the hydrogeological regime is not considered likely to have changed significantly in the intervening years.

8.10.6. The Lowestoft Formation at the site is expected to be of relatively low permeability and therefore have a limited hydraulic connection to the underlying Crag groundwater. It is likely that there are perched water tables in permeable lenses within the Lowestoft Formation.

8.10.7. The site is located on the Waveney and East Suffolk Chalk and Crag groundwater body (Water Framework Directive (WFD) reference GB40501G400600) (Ref. 8.10.3). This groundwater body has been classified by the Environment Agency as being of Poor Quantitative and Poor Chemical status, with an objective to being of Good Quantitative and Good Chemical status by 2027. The Poor Chemical status is attributed to impacts from agriculture as evidenced by elevated nitrate concentrations in groundwater. The proposed park and ride facility falls within a groundwater Nitrate Vulnerable Zone.

8.10.8. One licensed groundwater abstraction has been identified within 1km of the proposed park and ride facility (7/35/03/*G/0076) (Ref. 8.10.4). This is located 805m south-east of the proposed park and ride facility and has a maximum annual abstraction of 3,600m^3. The purpose of this abstraction is for general farming and domestic use.

8.10.9. Given the local geology and depth to groundwater there is not considered to be a connection between groundwater and surrounding surface water features. Surface water features are discussed further in the **Surface water section 8.11**.

8.10.10. The Suffolk Coastal and Waveney District Strategic Flood Risk Assessment makes no reference to groundwater flooding across the Suffolk Coastal and Waveney districts (Ref. 8.10.5). Flood risk is discussed further in the **Flood risk section 8.12**.

8.10.11. There is no known existing land contamination on the site. Further information on land quality is presented in the **Geology and land quality section 8.9**.

8.10.12. There are no designated ecological sites on or within 1km of the site.

b) Environmental design and embedded mitigation

i) Construction

8.10.13. Early in the construction phase, bunds and ditches would be used as appropriate to ensure that surface water run-off would be contained within the site and infiltrated into the underlying strata and off-site run-off that would otherwise enter the site is captured.

8.10.14. A piling risk assessment, in accordance with Environment Agency guidance, may be required to ensure that appropriate piling techniques are implemented at the site (by identifying and managing potential risks as a result of creating pathways to groundwater).

8.10.15. The CEMP would specify the measures required during enabling works and construction, which could include, but not be limited to:

- implementation of working methods during construction to ensure there would be no surface water run-off from the works, or any stockpiles, into adjacent surface watercourses/leaching into underlying groundwater in accordance with best practice;

[11] A Secondary (undifferentiated) Aquifer is designated in cases where it has not been possible to attribute either category Secondary A or Secondary B to a rock type.

[12] Principal Aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

[13] Groundwater Source Protection Zones are areas defined around groundwater sources used for public drinking water supply. The SPZ shows the risk of contamination from activities that might cause pollution in the area. The closer the activity the greater the risk.

- implementation of appropriate pollution incident control e.g. plant drip trays and spill kits;
- implementation of appropriate and safe storage of fuel, oils and equipment during construction;
- implementation of an appropriate MMP to document how the excavated materials will be dealt with; and
- implementation of a SWMP.

8.10.16. Remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) and ground stabilisation/improvement works would be undertaken if further investigation and risk assessments deemed it necessary.

8.10.17. The drainage/flood prevention strategies will consider the ground conditions including the permeability of the strata and the level of contamination present on-site.

ii) Operation

8.10.18. Appropriate drainage would be used, including the incorporation of SuDS measures where appropriate. This includes provision for some permeable surfaces, swales and detention ponds.

8.10.19. Petrol/oil interceptors and silt traps would be incorporated within the drainage design where considered necessary.

8.10.20. Foul sewage from the operational facility would be collected and would either pass through a septic tank or a package treatment works prior to its discharge.

iii) Removal and reinstatement

8.10.21. Once the need for the park and ride facility has ceased, the buildings and associated infrastructure would be removed in accordance with a removal and reinstatement plan, which would maximise the potential for re-use of materials. When the site has been cleared, the area would be returned to its current existing agricultural use.

8.10.22. The removal of the proposed park and ride facility would include the removal of any related drainage and SuDS measures. Any measures used to protect groundwater during construction would also be applied during the removal and reinstatement phase.

c) Preliminary assessment of effects

i) Construction

8.10.23. Assuming piling is not required, due to the shallow excavation depths and low permeability of the superficial deposits at the site, the construction phase of the development would not likely have an impact on the groundwater level and flow regime.

8.10.24. Were a spill or leak to occur during construction, the impact on groundwater within superficial deposits would be low. The effect of this impact on the Lowestoft Formation and head deposits groundwater would therefore not be significant.

8.10.25. The Crag groundwater would be protected from any spills or leaks by the overlying low permeability superficial deposits. Therefore, the impact on the Crag groundwater would not be significant.

8.10.26. Considering the baseline conditions of the site in combination with the environmental design and embedded mitigation, there would be no significant effects at the site with respect to groundwater during construction.

ii) Operation

8.10.27. The proposed works would not significantly increase the impermeable area of ground cover at the development site. The parking areas would predominantly be covered with permeable surfaces and water falling onto impermeable surfaces would be channelled into SuDS infrastructure. This would allow infiltration to the superficial aquifer and would mean that although the spatial distribution of infiltration would be changed by the development, the total volume of infiltration entering the ground would not be significantly changed.

8.10.28. The main risks from contamination would arise from fuel spills or leaks within the main car parks. It is not anticipated that significant spills or leaks would occur from vehicles used for commuting purposes. Silt traps and hydrocarbon interceptors would likely be required for some areas of the site drainage system to prevent the supply of sediment and other contaminants to the surface drainage network during operation. The provision of swales and detention ponds for areas of impermeable surface cover would protect the underlying groundwater from hydrocarbon contamination.

8.10.29. Considering both the baseline conditions of the site and the environmental design and embedded mitigation, there would be no significant effects at the site with respect to groundwater during operation.

iii) Removal and restoration phase

8.10.30. Considering both the baseline conditions of the site and the environmental design and embedded mitigation, there would be no significant effects at the site with respect to groundwater during the removal and restoration phase.

d) Additional mitigation and monitoring

8.10.31. Periodic inspection and maintenance of the drainage infrastructure would be required to ensure the continued efficacy of the surface water drainage system.

e) Preliminary assessment of residual effects

8.10.32. There are not expected to be any significant adverse residual effects during the construction, operation or the removal and reinstatement phases.

f) Completing the assessment

8.10.33. Once the proposals for the Sizewell C development as a whole are finalised, a full groundwater assessment of the proposals will be undertaken as part of the EIA and the results presented in the ES. The ES will present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 8.10.1 Summary of effects for the construction phase

Groundwater

Receptor	Impact	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Crag groundwater (Principal Aquifer); Lowestoft Formation diamicton (Secondary Aquifer (Undifferentiated)); groundwater abstraction (within 1km of site boundary).	Leaching and migration of existing contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers.	Piling risk assessment (if required). Ensuring all site activities are carried out in accordance with the CEMP. Remediation of on-site contamination if required. Appropriate drainage design.	Not significant.	Not required.	Not significant.
	Migration of contaminants via preferential pathways to deeper groundwater.		Not significant.		Not significant.
	Construction materials and the use of construction vehicles have the potential to introduce contamination to groundwater via drips and spillages and infiltration of run-off from the construction site.		Not significant.		Not significant.

Table 8.10.2 Summary of effects for the operational phase

Receptor	Impact	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Crag groundwater (Principal Aquifer); Lowestoft Formation diamicton (Secondary Aquifer (undifferentiated)); groundwater abstraction (within 1km of site boundary).	Increase in the impermeable area of ground cover at the development site.	Water draining from the car parking areas will pass through appropriate drainage, including the incorporation of SuDS and petrol/oil interceptors where necessary. This will allow infiltration to the superficial aquifer, whilst also protecting the underlying groundwater from hydrocarbon contamination.	Not significant.	Periodic inspection and maintenance of the SuDS infrastructure.	Not significant.
	Fuel spills or leaks within the car parking or bus parking areas infiltrating to groundwater.		Not significant.		Not significant.

Table 8.10.3 Summary of effects for the removal and reinstatement phase

Groundwater

Receptor	Impact	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Crag groundwater (Principal Aquifer); Lowestoft Formation diamicton (Secondary Aquifer (Undifferentiated)); groundwater abstraction (within 1km of site boundary).	Leaching and migration of existing contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers.	Ensuring all site activities are carried out in accordance with the CEMP. Remediation of on-site contamination if required. Appropriate drainage design.	Not significant.	Not required.	Not significant.
	Migration of contaminants via preferential pathways to deeper groundwater.		Not significant.		Not significant.
	Construction materials and the use of construction vehicles have the potential to introduce contamination to groundwater via drips and spillages and infiltration of run-off from the construction site.		Not significant.		Not significant.

8.11. Surface water

a) Baseline environment

i) Surface water features

8.11.1. Light Detection and Ranging (LiDAR) data show that the highest ground levels, above 31m Ordnance Datum Newlyn (ODN), are located in the north-east corner of the site. Ground levels become progressively lower towards the south and west of the site, with the lowest ground levels slightly below 19m ODN at the south-west edge.

8.11.2. The site is located within the catchment of the Minsmere Old River (water body reference GB105035046270). The Minsmere Old River is located approximately 1200m south of the proposed park and ride facility. The A12 road separates the proposed park and ride facility from this watercourse.

8.11.3. An unnamed tributary of the Minsmere Old River is located along the western boundary of the site. This watercourse currently receives surface drainage from arable land and woodland in the area.

8.11.4. A series of ponds are also present in the vicinity of the site, including one within the redline boundary and in the vicinity of the site. This includes the pond in the woodland immediately to the west of Moat Hall, several other pond features in the grounds of Moat Hall, Darsham Cottage and White House Farm to the north, and a larger pond adjacent to the unnamed road to Darsham Old Hall to the south of the A12.

ii) Fluvial geomorphology

8.11.5. Geomorphology and hydromorphology are key factors contributing to whether a water body can achieve or maintain Good Ecological Status.

8.11.6. The unnamed tributary of the Minsmere Old River channel located at the bottom of a slope at the western boundary of the site has been straightened and appears to have been modified for land drainage purposes. The Minsmere Old River is designated as heavily modified water body. The hydrological regime is of sufficient quality to support Good Ecological Status (Ref. 8.11.1).

iii) Water quality

8.11.7. Physico-chemical and chemical data presented on Catchment Data Explorer have been reviewed for the Minsmere Old River in the vicinity of the proposed site boundary. Chemical status of the river is Good.

8.11.8. Physico-chemical data indicate that the Minsmere Old River in the vicinity of the site boundary is at Good or High status for ammonia, Biochemical Oxygen Demand, dissolved oxygen, pH, phosphate and temperature, and are not adversely affected by pollutants such as copper, Triclosan and zinc. The water body is at Good Physico-Chemical Status. This suggests that water quality in the catchment is generally good.

8.11.9. There is evidence of poor water quality (high turbidity) throughout the 'unnamed tributary of the Minsmere Old River' adjoining the site, in particular, between the points where the channel crosses underneath the rail line. This may be a result of run-off from the rail line, road, agricultural land and/or residential properties.

b) Environmental design and embedded mitigation

i) Construction

8.11.10. Early in the construction phase, bunds and ditches would be used as appropriate to ensure that surface water run-off would be contained within the site and infiltrated into the underlying strata and off-site run-off that would otherwise enter the site is captured.

8.11.11. The existing pond on the site would be retained within the site layout. A buffer zone will be maintained, minimising disturbance to the watercourse running adjacent to the site boundary.

8.11.12. Mitigation measures would be incorporated into the construction and the removal and reinstatement phases and could include (but are not limited to):

- the wheels of all vehicles would be washed before leaving site;
- concrete and cement mixing and washing areas would be situated at least 10m away from surface water receptors. These would incorporate settlement and recirculation systems to allow water to be re-used. All washing out of equipment would be undertaken in a contained area, and all water would be collected for off-site disposal;
- all fuels, oils, lubricants and other chemicals would be stored in an impermeable bund with at least 110% of the stored capacity. All refuelling would take place in a dedicated impermeable area, using a bunded bowser. Biodegradable oils should be used where possible; and
- spill kits would be available on-site at all times. Sand bags or stop logs would also be available for deployment on the outlets from the site drainage system in case of emergency spillages.

ii) Operation

8.11.13. The operational drainage system would incorporate SuDS measures where appropriate, to minimise potential impacts on surface water receptors. The main embedded mitigation comprises the provision of four swales and two detention ponds.

iii. Removal and reinstatement

8.11.14. Once the need for the facility has ceased, the buildings and associated infrastructure would be removed in accordance with a removal and reinstatement plan, which would maximise the potential for re-use. When the site has been cleared, the area would be returned to its current existing agricultural use.

8.11.15. Controls to be adopted during the restoration of the site would be as described for the construction phase.

c) Preliminary assessment of effects

i) Construction

8.11.16. The shallow perimeter bund would contain surface water run-off within the site before it infiltrates to ground. The site would be isolated from the wider environment, including the Minsmere Old River and its tributary and as a result the construction phase of the development would not likely have any significant effects.

8.11.17. The existing pond within the site would be retained, and hence there will be no loss of habitat.

ii) Operation

8.11.18. There would be no significant effects during operation. The proposed drainage system would contain surface water run-off within the site before infiltrating it to ground, whilst silt traps and hydrocarbon interceptors would intercept pollutants.

iii) Removal and reinstatement

8.11.19. Considering both the baseline conditions of the site and the embedded mitigation measures proposed there would be no significant effects at the site.

d) Additional mitigation and monitoring

8.11.20. Once operational, periodic inspection and maintenance of the SuDS infrastructure may be required to ensure the continued efficacy of the surface water drainage system.

e) Preliminary assessment of residual effects

8.11.21. No significant adverse residual effects are expected during the construction, operation or the removal and reinstatement phases.

f) Completing the assessment

8.11.22. Once the proposals for the Sizewell C development are finalised, a full assessment of the potential effects on the surface water environment will be completed as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 8.11.1 Summary of effects for the construction phase
Surface water

Topic / receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Minsmere Old River.	Contamination of the river.	Isolation of the site from the wider environment to prevent off-site effects. CEMP measures including pollution prevention measures (e.g. wheel washing and separation of working areas from surface waters.	Not significant.	None proposed.	Not significant.
Tributary of Minsmere Old River.	Contamination of the river.		Not significant.		Not significant.
Existing pond within the site.	Pollution of controlled waters.	CEMP measures including pollution prevention measures (e.g. wheel washing and separation of working areas from surface waters.	Not significant.		Not significant.

Table 8.11.2 Summary of effects for the operational phase
Surface water

Topic / receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Minsmere Old River.	Contamination of the river.	Swales will be incorporated into the design, with all drainage going to ground. Septic tank or package plant to treat sewage.	Not significant.	Active management and maintenance of the drainage system to maximise its efficacy.	Not significant.
Tributary of Minsmere Old River.	Contamination of the river.		Not significant.		Not significant.
Existing pond within the site.	Pollution of controlled waters.	Silt traps and hydrocarbon interceptors will be incorporated into the design.	Not significant.		Not significant.

Table 8.11.3 Summary of effects for the removal and reinstatement phase

Surface water

Topic / receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Minsmere Old River.	Contamination of the river.	Isolation of the site from the wider environment to prevent off-site effects. CEMP measures including pollution prevention measures (e.g. wheel washing and separation of working areas from surface waters.	Not significant.	None required.	Not significant.
Tributary of Minsmere Old River.	Contamination of the river.		Not significant.		Not significant.
Existing pond within the site.	Pollution of controlled waters.	CEMP measures including pollution prevention measures (e.g. wheel washing and separation of working areas from surface waters .	Not significant.		Not significant.

8.12. Flood risk

8.12.1. The figures in flood risk are presented in **Volume 3** as **Figures 8.12.1** and **8.12.2**.

a) Baseline environment

8.12.2. The highest ground levels, located in the north-east corner of the site, are slightly over 31m Above Ordnance Datum (AOD). The land slopes gradually to the south and west of the site, with the lowest ground levels, at the south-west boundary of the site, slightly below 19m AOD.

8.12.3. A watercourse runs along the western boundary of the site before continuing in a southerly direction under the railway line towards the A12, eventually joining the Minsmere River.

8.12.4. The River Yox, a tributary of the Minsmere River, flows approximately 1.1km to the south of the site. Both the River Yox and Minsmere River are classed as Main Rivers by the Environment Agency.

8.12.5. The maps identify the dominant solid geology of the area as Crag (marine deposits). This geology has variable permeability and overall the site is considered to be permeable greenfield land.

8.12.6. The site is entirely located within Flood Zone 1 and so the risk of river flooding to the site is low (**Figure 8.12.1**).

8.12.7. The Environment Agency 'flood risk from surface water' map identifies two areas within the site where surface water flood risk is 'high'. The first area is a strip of land at the western edge of the site. The second area is located in the north-east corner of the site, where the proposed access road would meet the A12 (**Figure 8.12.2**).

Table 8.12.1 Summary of flood risk at the site

Source of flooding	Flood risk
Fluvial	Flood Zone 1, low: less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
Tidal/coastal	Flood Zone 1, low: site beyond the tidal extent. Less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
Surface water (pluvial)	Most of the site – very low: less than 1 in 1,000 annual probability of surface water flooding in any year (<0.1%). 20-25 m wide strip of land, west edge of the site – high: greater than 1 in 30 annual probability of surface water flooding in any year (>3.3%). Area in north-east corner of site – high: greater than 1 in 30 annual probability of surface water flooding in any year (>3.3%).
Groundwater	Low: soil is generally permeable but the site is located on higher ground levels than some surrounding areas.
Sewers	Internal – low: greenfield site and surrounding arable land. External – low to moderate: three properties are located in higher ground levels near the site.
Reservoirs and other artificial sources	Not at risk of flooding from reservoirs.

b) Environmental design and embedded mitigation

8.12.8. The Sequential Test aims to steer new development away from areas of high flood risk. The positioning of the site in Flood Zone 1 complies with this requirement. There would be no loss of functional floodplain.

i) Construction

8.12.9. In the early stages of construction, bunds and ditches would be used as required to capture any off-site run-off that would otherwise flow across the site and to exclude any run-off from adjacent areas.

8.12.10. Monitoring and maintenance of the drainage system would be carried out to preserve its integrity and maintain its design capacity.

ii) Operation

8.12.11. It is likely that infiltration to ground would be viable at this site. SuDS would be implemented to provide a natural approach to managing drainage. The main car parks would have permeable surfaces and there would be swales and detention ponds. One of these detention ponds would be located in the north-east corner of the site, close to where the surface water flood risk is currently high.

8.12.12. Water falling onto impermeable surfaces (e.g. access roads) would be channelled into the SuDS infrastructure. Run-off from buildings would be disposed to soakaways.

8.12.13. Parking areas and ancillary buildings would be located outside the areas identified to be at high risk from surface water flooding.

8.12.14. Climate change will be considered in the detailed drainage design, in particular future changes in rainfall intensity. The drainage design will consider exceedance flows to limit water depths in parking areas. This would be achieved by using the site topography to direct surface water flows to less critical areas of the site from where water would infiltrate to ground.

8.12.15. Monitoring and maintenance of the drainage system would be carried out to preserve its integrity and maintain its design capacity.

iii) Removal and reinstatement

8.12.16. During restoration of the land back to agricultural use, the buildings, hard standing, site drainage, perimeter earth bunds and temporary landscaping would be removed. No specific flood risk mitigation measures are relevant to this phase, other than removing the park and ride drainage as late as possible within the phase.

c) Preliminary assessment of effects

8.12.17. The use of perimeter bunds and ditches, installed early in the construction phase means there is not likely to be significant adverse effect to flood risk during the construction phase.

8.12.18. During operation, the proposed drainage system would attenuate surface water run-off, resulting in no additional flood risk. The detention pond in the north-east corner of the site would help intercept existing surface water flow from adjacent land and prevent it accumulating on the A12. A beneficial reduction in surface water flood risk compared to the current situation is therefore anticipated.

8.12.19. After the removal and reinstatement phase, the site would be returned to its existing agricultural use. There is not likely to be a significant effect on flood risk compared to the existing situation.

d) Additional mitigation and monitoring

8.12.20. The management of exceedance flows and the associated risks they present will be considered as part of the drainage design.

e) Preliminary assessment of residual effects

8.12.21. Monitoring and maintenance, together with suitable design for exceedance flows, would manage the minor residual risk to result in negligible effects. There will be no significant effect during construction, operation or in the removal and reinstatement phase.

f) Completing the assessment

8.12.22. A full flood risk assessment (FRA) for this site will be submitted as part of the application for development consent.

Table 8.12.2 Summary of effects for the construction phase

Flood risk

Topic / receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Surface water.	Increase in impermeable area and associated surface water run-off during construction of site.	Bunds and ditches constructed to contain surface water run-off on-site. Monitoring and maintenance to preserve integrity and maintain design standard.	Not significant.	Management of exceedance flows.	Not significant.
	Off-site surface water prevented from crossing the site.	Bunds and ditches constructed to contain surface water run-off on-site. Monitoring and maintenance to preserve integrity and maintain design standard.	Not significant.	Management of exceedance flows.	Not significant.

Table 8.12.3 Summary of effects for the operational phase

Flood risk

Topic / receptor	Impacts	Environmental design and embedded mitigation	Assessment of effects	Additional mitigation	Residual effects
Surface water.	Increase in impermeable area and associated surface water run-off from the site.	Surface water from impermeable areas discharged to infiltration SuDS including an allowance for climate change. Infiltration SuDS address existing areas of flood risk. Permeable surfaces used for car parking areas. Monitoring and maintenance of SuDS to preserve integrity and maintain design standard.	Beneficial	Management of exceedance flows.	Not significant.

8.13. Traffic and transport

a) Baseline environment

8.13.1. The northern park and ride site is located to the west of the village of Darsham and the A12, the east of the East Suffolk line and to the north of Darsham railway station.

i) Highway network

8.13.2. The site is located on the western side of the A12, a single carriageway road with a speed limit of 40mph. The A12 carried approximately 14,000 vehicles per day in 2015, the base year for Sizewell C traffic modelling.

8.13.3. The site lies immediately north of Darsham level crossing where the A12 intersects the East Suffolk line. The crossing is an automatic half barrier level crossing. Darsham railway station is located immediately west of the level crossing.

8.13.4. There is currently an hourly passenger service in each direction between Ipswich and Lowestoft stopping at Darsham. Trains run between approximately 06:00 and 23:00.

8.13.5. On average therefore, the level crossing closes twice an hour for passenger trains during the Sizewell C traffic modelled periods 06:00-09:00 and 15:00-19:00 on weekdays. These closures are built into the VISSIM traffic model of the area.

8.13.6. Willow Marsh Lane is a secondary road which joins the A12 at a priority junction to the north of the site.

8.13.7. The highway network adjacent to the site does not have a recurring issue of accidents. Three accidents were recorded in the period from 2013 to 2017 along the A12 between Darsham railway station and Willow Marsh Lane, all of which were recorded as being slight in severity, the least serious category.

b) Environmental design and embedded mitigation

i) Construction

8.13.8. As described in **Volume 1**, **Chapter 13** the park and ride facility would be accessed from the north via a new roundabout on the A12.

8.13.9. The roundabout would be constructed first, to provide access to the site and facilitate construction of the park and ride site. It has been designed to sit off-line, i.e. not along the present alignment of the A12, to minimise disruption to existing traffic on the A12 during the construction period. Most of the construction activity would not impact on A12 traffic but when the tie-ins to the A12 are being built there would be some temporary traffic management measures in place. This is likely to be traffic signal controlled shuttle working, which would impose some delay on A12 traffic during this period.

8.13.10. Once the roundabout is built, construction traffic would access the site using the roundabout. The construction of the park and ride would be mainly self-contained within the site boundaries and have little impact on the A12 itself.

8.13.11. Whilst the construction site is located adjacent to the East Suffolk line, it would not be practicable to transport construction materials by rail: most construction materials are more suited to road transport and the site also requires earthworks which could not be practicably undertaken using rail transport.

8.13.12. Where possible, the works both within the park and ride site boundary and on the public highway to form the new access would be undertaken by the same contractor to reduce vehicle numbers. The contractor would encourage workers to arrive by rail where possible, though the numbers able to do so would probably be small. For those arriving by car, the contractor would provide parking within the construction site and prevent worker's vehicles from parking along the A12 or Willow Marsh Lane, or in nearby car parks or laybys.

ii) Operation

8.13.13. The northern park and ride is a major element of the embedded mitigation associated with the construction of Sizewell C. It would remove a large number of construction worker trips from the local road network between the park and ride and the main construction site and would help particularly in reducing impacts on the A12, Yoxford and the B1122.

8.13.14. The northern park and ride includes the following features to reduce the impacts on the surrounding road network:

- the access point with the A12 has been moved further north than previously proposed to address concerns raised at Stage 2 consultation; and
- the access would be a new roundabout on the A12, which reduces queuing for traffic waiting to enter the A12 and also offers improved crossing amenity for pedestrians in the form of islands.

c) Preliminary assessment of effects

i) Construction

8.13.15. The construction of the new roundabout and diversion of the existing Willow Marsh Lane alignment would generate HGV movements transporting materials for the construction of the highway works. During the peak period of its construction, the northern park and ride site would be served by approximately 21 HGVs and 100 construction workers per day.

8.13.16. During the highway works to create the park and ride site access, short-term road closures and diversions may be necessary. Traffic diverted away from Willow Marsh Lane during highway construction works would increase the vehicle miles travelled, and would lead to a short-term increase in vehicles using the A144 and its junction with the A12. However, the traffic volume would be very small and the effect of this would be insignificant.

8.13.17. The early years transport modelling covers the period when the park and ride facility would be under construction, and includes the vehicle trips associated with transporting materials and workers to and from all the associated development sites, not just this park and ride construction site.

8.13.18. During this early years period, the A12 traffic volume without Sizewell C traffic would be 15,350 vehicles per day (vpd). Sizewell C construction traffic would add a further 650 vpd to the A12 in this location. This would increase the traffic volume in the early years to 16,000 vpd. This is a 3%-4% increase in A12 traffic flows. The day to day fluctuation in traffic volumes is ±5% so this change is unlikely to be noticeable. The volume is well within the traffic-carrying capacity of the A12.

8.13.19. The assessment found that there would be no significant adverse transport and traffic effects during the construction phase.

ii) Operation

8.13.20. The northern park and ride site would be used by construction workers travelling to and from the Sizewell C main development site. The park and ride facility would be operational for up to ten years.

8.13.21. By having a park and ride facility located adjacent to the A12, a significant number of Sizewell C construction worker cars would be taken off the wider highway network, particularly the B1122 or Sizewell Link Road. The park and ride site would therefore reduce the transport and traffic impact of the Sizewell C construction period.

8.13.22. In the peak construction year, the A12 traffic volume without the Sizewell C project would be 16,050 vpd. The rail-led strategy would add 2,300 vpd to this total or the road-led strategy would add 2,350 vpd. The increase in A12 traffic flows would therefore be 13%–15%. Microsimulation modelling, which includes the effect of approximately half hourly level crossing closures, shows that the local highway network would continue to operate satisfactorily. The new roundabout accessing the park and ride site has sufficient capacity to accommodate the predicted flows.

8.13.23. The positive effects of the park and ride, i.e. removing significant numbers of vehicles from a significantly longer section of the road network (the B1122) outweigh the negative effects of an increase in traffic along a relatively short section of the A12 between Yoxford and Darsham.

iii) Removal and reinstatement

8.13.24. Once the construction of Sizewell C is complete, the northern park and ride facility would be removed and the site returned to agricultural use. This would generate some HGV movements.

8.13.25. Effects would be similar to those experienced in the construction phase but smaller in nature and duration due to the retention of the roundabout.

d) Additional mitigation and monitoring

8.13.26. No additional monitoring is anticipated to be required in the post-operation phase.

e) Preliminary assessment of residual effects

i) Construction

8.13.27. The residual effects during the construction phase are anticipated to be the same as those set out under preliminary effects described above.

ii) Operation

8.13.28. The residual effects during the operation phase are anticipated to be the same as those set out under preliminary effects described above.

iii) Removal and reinstatement

8.13.29. The residual effects during the removal and reinstatement phase are anticipated to be the same as those set out under preliminary effects described above.

f) Completing the assessment

8.13.30. The further work needed to complete the assessment is:

- determine whether the rail-led or road-led strategy will be taken forward;
- inalise the VISUM strategic modelling;
- on the basis of the VISUM traffic flows and final design layout, revisit the detailed VISSIM junction modelling; and
- report findings in Transport Assessment and ES which will be submitted with the application for development consent.

8.14. Comparison between rail-led and road-led strategies

8.14.1. As the design of the northern park and ride facility is identical under both the road-led and rail-led strategies, the assessments presented in this chapter in relation to landscape and visual, terrestrial ecology, amenity and recreation, terrestrial historic environment, soils and agriculture, geology and land quality, groundwater, surface water and flood risk are equally valid under both strategies and there would be no differences in the significance of effects between the two.

8.14.2. The traffic and transport assessment presented in this chapter is equally valid under both strategies although the rail-led strategy would add approximately 2,300 vehicles per day to the number of vehicles on the A12 at this location whilst the road-led strategy would add approximately 2,350. However, there would be no differences in the significance of traffic, noise or air quality or vibration effects between the two strategies in the vicinity of this location despite this small difference in vehicle movements for the two strategies.

9. Southern Park and Ride PEI

9.1. Introduction to Preliminary Environmental Information

9.1.1. The southern park and ride facility is described in detail in **Volume 1**, **Chapter 14** and is envisaged to comprise:

- car parking areas for around 1,250 spaces (of which 40 would be accessible spaces and ten would be pick up only spaces);
- ten spaces for minibuses/vans/buses;
- 80 motorcycle parking spaces;
- secure cycle parking for approximately 20 bikes;
- secure bus terminus and parking, including shelters;
- perimeter security fencing and lighting;
- a welfare building comprising toilets, bus drivers' rest room, security and administration offices;
- a security building;
- security booth;
- on-site topsoil and sub-soil storage to facilitate site restoration following cessation of use of the park and ride facility;
- screening mounds;
- external areas including roadways, footways, landscaping, surface water management areas and drainage infrastructure;
- a postal consolidation facility; and
- a Traffic Incident Management Area (TIMA) to enable Heavy Goods Vehicles (HGVs) to be held in the event of an emergency.

9.1.2. It is anticipated that the park and ride facility would be operational seven days a week between 05:00 and 01:00. The movement of buses would respond to the shift patterns of workers coming to and from the main development site. There are typically fewer shifts on Fridays and at weekends.

9.1.3. The use of the park and ride facility would mirror the construction phases of Sizewell C. When the construction workforce for the Sizewell C development is at its peak the park and ride facility would also be at peak use. Either side of this peak, use will vary according to location of workforce and demand. The size of the site is sufficient to enable the layout to be adjusted to accommodate any temporary increase in peak use.

9.1.4. The southern park and ride facility would be a temporary facility. Once the need for the facility has ceased, the buildings and associated infrastructure would be removed in accordance with demolition and restoration plans. Unless separate consent is obtained in the future to authorise any re-use, the area would be returned to agricultural use.

9.1.5. The proposals are likely to have some effects on the environment during the construction, operation, removal and restoration phases. The principal features, likely to have a significant adverse or beneficial effect on the project, are explained below.

9.1.6. This chapter presents each of the topics in relevance to the site in turn, under the following sub-headings: (a) Baseline environment, (b) Environmental design and embedded mitigation, (c) Preliminary assessment of effects, (d) Additional mitigation and monitoring, (e) Preliminary assessment of residual effects and (f) Completing the assessment.

9.2. Landscape and visual

9.2.1. The figure for landscape and visual is presented in **Volume 3** as **Figure 9.2.1**

a) Baseline environment

9.2.2. The land use within the study area selected for the Landscape and Visual Impact Assessment (LVIA) of 2 kilometres (km) from the site boundary is predominantly arable farmland, with well-defined hedgerow field boundaries, interspersed with scattered woodlands and copses. The site itself is in arable use, and comprises sections of two adjoining fields. The site boundary largely follows the existing field boundaries, except the south-eastern perimeter where it aligns with the northern edge of the A12 embankment and northbound slip road; and the north-western boundary which crosses through a field.

9.2.3. Four wooded copses lie along the outer edges of the site along the eastern, northern and western boundaries, including Wonder Grove and Whin Belt. The southern extent of Whin Belt extends into the site boundary, and there is one pond within the site and a number of small ponds adjacent to the site boundary.

9.2.4. With the exception of Whin Belt and the ponds, there are no other landscape features within the site. While the site comprises two adjoining fields, there is no dividing field boundary between the different field units.

9.2.5. At a national level, the site and the majority of the 2km study area are situated within National Character Area 83 (NCA83): South Norfolk and High Suffolk Claylands (Ref. 9.2.1). NCA83 covers a large area of central East Anglia, and is a predominantly flat clay plateau incised by numerous small-scale wooded river valleys.

9.2.6. At a local level, the site is located in the 'Plateau Estate Farmlands' landscape character type as identified in the Suffolk County Landscape Character Assessment (Ref. 9.2.2) and shown on **Figure 9.2.1**. This is a largely arable landscape with scattered woodland cover, which often feels open. The key characteristics are described in the Landscape Character Assessment as:

- *"Flat landscape of light loams and sandy soils;*
- *large scale rectilinear field pattern;*
- *network of tree belts and coverts;*
- *large areas of enclosed former heathland;*
- *18th-19th & 20th century landscape parks;*
- *clustered villages with a scattering of farmsteads around them;*
- *former airfields;* and
- *vernacular architecture is often 19th century estate type of brick and tile"*.

9.2.7. The locations of different groups of people within the 2km study area who may experience views of the proposed development are shown on **Figure 9.2.1**. These include the following:

- The settlements of Wickham Market, Lower Hacheston, Marlesford, and Campsea Ashe. A viewpoint will be provided at Main Road/Church Farm, Wickham Market to the south-west in the final assessment.
- Transport routes including the A12, the B1116 to the west of the site, and B1078 into Wickham Market, which connects to the B1116. Viewpoints will be provided from the A12 to the south and the B1116 to the west and north-west.
- Recreational routes including the footpath crossing the site; a footpath to the east of the site, between the A12 and Marlesford which partly runs along the site boundary; a footpath to the south-east of the site, between the A12 and Brick Kiln Cottages; a footpath to the south of the site, between the A12 and Bottle and Glass Cottages; and footpaths around the junction of the B1116 and B1078. Viewpoints will be provided from public footpaths to the west, north-east, south and south-east.
- Dispersed farmsteads, with the closest residential properties being a row of houses to the south-west of the site, along B1078/Main Road (close to the junction with the B1116); The Rookery (farmstead) to the north of the site along the B1116; and Bottle and Glass Cottage and Brick Kiln Cottage to the east of the site, near Lower Hacheston. Viewpoints will be provided at Bottle and Glass Cottages to the south, The Rookery to the north-west and Keepers Lane/Moat Farm to the north-east.

9.2.8. Visibility from many of these locations is likely to be limited due to a combination of landform, woodland and established hedgerows. In most cases, visibility is likely to be limited to approximately 300 metres (m) to the north of the site, intermittently up to 2km to the north-east, 700m to the east and south-east, 400m to the south, and 500m to the west.

9.2.9. The Suffolk Coasts and Heaths Area of Outstanding Natural Beauty (AONB) is located outside of the study area, approximately 4.5km to the south-east of the site.

9.2.10. A locally designated landscape referred to as a Special Landscape Area (SLA) (comprising the valleys of the rivers Alde and Deben and their tributaries) covers much of the study area, and wraps around the site to the north, east, and west.

b) Environmental design and embedded mitigation

9.2.11. A number of mitigation measures have been identified and incorporated into the design for both the construction and operational phase of the proposed development, which will help to manage and reduce potential environmental effects. These include the following:

- A 2-3m high grassed topsoil and sub-soil storage and screening mound will be located along the southern boundary of the proposed development, where the site runs adjacent to the A12.
- A 2-3m high grassed topsoil and sub-soil storage and screening mound will also run along part of the eastern boundary.
- The remainder of the eastern boundary, north and part of the western boundary will be screened by a 2-3m high topsoil and sub-soil storage mound. The remainder of the western boundary, where it runs adjacent to bridleway E-288/008/0, will include retained existing woodland forming part of Whin Belt.
- All boundary hedgerows would be retained other than a short section approximately 50m in length, which would be lost at the location of the proposed access road.
- Landscape proposals for the development include grassed areas, tree and shrub planting. These would be maintained for the lifetime of the development, before being removed when the agricultural use is reinstated. A temporary Sustainable Drainage System (SuDS) would be implemented to minimise surface water run-off and prevent diffuse pollution from sediment arising. This design would include the incorporation of swales.
- Planting of vegetation between the site and the Public Rights of Way (PRoWs) and bridleway would help to soften the effects of the proposed development over time, including the screening mounding proposed around the perimeters of the site.

9.2.12. It is anticipated that the retention of existing boundary vegetation proposed for the construction phase would mitigate any potential impacts during the removal and reinstatement phase. Hedgerows and trees would be replanted to replace any lost at the start of construction so as to return the site as close as possible to its pre-construction condition.

c) Preliminary assessment of effects

i) Construction

9.2.13. During construction, there would be a localised change to the landscape character of the site and its immediate context. There would also be localised visual effects for users of roads, footpaths and bridleways in close proximity to the site. Given the localised extent of the effects and the very short-term duration of the construction period, effects are unlikely to be significant.

ii) Operation

9.2.14. During operation, there would be a localised effect on the character of the landscape within the site, arising from the change from arable fields to car parking with associated infrastructure. The proposed mounding around most perimeters of the site would also create a change to the largely flat nature of the site at present. Effects would be significant, adverse and temporary in nature.

9.2.15. Beyond the site boundaries, effects on landscape character would rapidly dissipate. Within approximately 400m of the site boundary, effects on landscape character would have reduced so that they are not significant. The field patterns and vegetation cover, two of the key characteristics of the surrounding landscape, would be largely unchanged.

9.2.16. Desk and field study has confirmed that the proposed development will not be visible from Wickham Market, Lower Hacheston, Marlesford and Campsea Ashe due to a combination of intervening landform and vegetation. There are unlikely to be any significant visual effects for any settlements.

9.2.17. For users of roads in the surrounding area, there are likely to be views of the proposed development from a short section of B1078 closest to the site where it joins the B1116, along the B1116, towards the northbound slip road to the A12, and of the proposed entrance to the park and ride facility. The proposed development is also likely to be visible from sections of the B1116. From the section of road between the junction with the B1078 and Easton Road/ Glevering Park, views are generally more open, and there will be open views across the southern portion of the proposed development, albeit Whin Belt provides some screening of the northern portion of the proposed development. The proposed development will be visible from the A12 where it passes the southern site boundary, and there will open, short distance views of the majority of the park and ride facility. However, views are limited to a relatively short section of the road. Given the limited lengths of these routes where views would be possible, there are unlikely to be any significant visual effects for users of any of the surrounding roads.

9.2.18. Desk and field study has confirmed that there will be open, close range views of the proposed development from those footpaths and bridleways that cross or immediately adjoin the site. From the footpath south and east of the site, between the A12 and Marlesford, views of the proposed development become screened as the footpath passes a woodland block adjacent to the eastern boundary of the site. Similarly, from the bridleway along the western boundary of the site, woodland at Whin Belt will screen views of the proposed development. There are likely, however, to be localised significant effects for users of these routes, over the short stretches where they pass through or immediately by the site, in the short to medium term.

9.2.19. From the footpath to the south-east of the site, between the A12 and Brick Kiln Cottages, views towards the site are relatively open from some stretches of the route. From the footpath to the south of the site, between the A12 and Bottle and Glass Cottages, there are generally open views across the foreground field and A12 towards the site. However, in both circumstances, there are unlikely to be any significant visual effects given the presence of the A12 in the foreground of views.

9.2.20. From the footpaths around the junction of the B1116 and B1078, views of the site itself are largely screened by intervening vegetation and the rising landform. Views of the proposed development are only likely to be visible where a footpath meets the B1116 and a break in field boundary hedgerow exists. There are unlikely to be any significant visual effects for users of these routes.

9.2.21. The proposed development may be visible from a limited number of properties. The majority of rural properties are generally well-enclosed by boundary vegetation. Effects on residential amenity would be mitigated via planting as appropriate to each case as part of the embedded landscape proposals.

9.2.22. Given the distance of the Suffolk Coast and Heaths AONB from the site (approximately 4.5km to the south-east of the site), and the relatively limited extent of visual effects, the proposed park and ride site would have no effect on the AONB. The SLA is also likely to be beyond the area where the proposals would be visible, and it is unlikely that there would be any significant effects on the special qualities of the SLA or the purposes of its designation.

iii) Removal and reinstatement

9.2.23. During restoration of the land back to agriculture, the buildings, hard standing, site drainage, perimeter earth bunds and temporary landscaping would be removed, and the landscape and visual impacts experienced would be very similar to those of the construction phase. Given the relatively short duration of the works and the limited extent of the likely effects, the effects are unlikely to be significant.

d) Additional mitigation and monitoring

9.2.24. The preliminary assessment of effects presented above identifies potential significant effects on the landscape character of the site and its immediate surroundings during operation, as well as changes to views for users of localised stretches of the PRoWs in close proximity to the site.

9.2.25. The localised effects on landscape character of the construction and operation of the park and ride facility are unlikely to be able to be mitigated by any additional mitigation measures as there will remain a fundamental change in the character of the site and its immediate surroundings.

e) Preliminary assessment of residual effects

9.2.26. During construction there are unlikely to be any significant residual effects on landscape character, designated landscapes or visual effects.

9.2.27. During the operational stage of the proposed development, it is considered that there will be significant residual effects on the character of the landscape within and immediately around the site. There are also likely to be significant effects, in the short to medium term only, for users of footpaths and bridleways that cross or immediately adjoin the site, for short stretches.

9.2.28. During restoration of the land back to agricultural use, there are unlikely to be any significant residual effects on landscape character, designated landscapes or visual effects.

f) Completing the assessment

9.2.29. The Environmental Statement (ES) will present a full LVIA underpinning the conclusions drawn above in relation to significant effects, updated where relevant to account for any design changes. It will utilise the methodology, study area and viewpoint locations previously discussed with stakeholders.

Table 9.2.1 Summary of effects for the construction phase

Landscape and visual

Topic/receptor	Potential impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Landscape character	Localised changes to landscape character and landscape features within the site and surrounding landscape.	None required	Not significant	None required	Not significant
Visual receptors	Changes to views for users of roads, footpaths and bridleways in close proximity to the site.	None required	Not significant	None required	Not significant

Table 9.2.2 Summary of effects for the operational phase

Landscape and visual

Topic/receptor	Potential impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Landscape character within the site and its immediate context.	Localised change to landscape character due to introduction of new car parking with associated infrastructure, and proposed mounding around most perimeters of the site.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Significant	None	Significant
Landscape character beyond approximately 400m of the site boundary.	Changes to landscape character and key characteristics within the surrounding landscape.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Not significant	None required	Not significant
Users of footpaths and bridleways that cross or immediately adjoin the site, for short stretches.	Views of new car parking with associated infrastructure, and proposed mounding around most perimeters of the site.	Retention of established vegetation. Introduction of appropriate landscape proposals, including between the site and the public rights of way closest to it.	Significant in the short to medium term only.	None	Significant in the short to medium term only.
Other visual receptors.	Changes to views for local residents, users of roads, other footpaths and bridleways in close proximity to the site.	None required	Not significant	None required	Not significant
Suffolk Coast and Heaths AONB.	Effects on special character and purposes of designation.	None required	Not significant	None required	Not significant
Special Landscape Area - River Alde valley.	Effects on special character and purposes of designation.	None required	Not significant	None required	Not significant

Table 9.2.3 Summary of effects for the removal and reinstatement phase

Landscape and visual

Topic/receptor	Potential impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Landscape character	Changes to landscape character and landscape features within the site and surrounding landscape.	None required	Not significant	None required	Not significant
Visual receptors	Changes to views for users of roads, footpaths and bridleways in close proximity to the site.	None required	Not significant	None required	Not significant

9.3. Terrestrial ecology and ornithology

9.3.1. The figures for terrestrial ecology and ornithology are presented in **Volume 3** as **Figures 9.3.1** and **9.3.2**.

a) Baseline environment

9.3.2. There are no statutory designated sites of nature conservation importance within 5km of the proposed development and statutory designated sites have therefore been scoped out of further assessment. Six non-statutory designated County Wildlife Sites are present within 2km of the proposed development. Of these, three are located within 1km of the proposed development; Catts Wood, 500m to the west, Lower Hacheston Meadow, 600m to the south and Great Wood, Glevering Hall, 1km to the west.

9.3.3. The proposed development site comprises large arable fields growing intensively managed crops, separated by a track and bounded by a mixture of fences and hedgerows. Habitats within the immediate surroundings of the proposed development site consist of six woodland blocks, comprising broad-leaved plantation, broad-leaved semi-natural woodland or lowland mixed deciduous woodland, an improved grassland field and an area of tall ruderal herbs. A single pond is present within the proposed development site but was dry at the time of survey. Five hedgerows are present within the proposed development boundary, of which two are considered to be species-rich (containing five or more woody species). Deciduous woodland, hedgerows and ponds are habitats of principal importance (Ref. 9.3.1, section 41).

9.3.4. Several scarce plant species and six non-native invasive plant species occur within 2km of the proposed development site; however, none of these species were recorded within or adjacent to the site.

9.3.5. There are no records of amphibians within or adjacent to the site although there are records of common toad[1] (*Bufo bufo*) and great crested newt[2] (*Triturus cristatus*) within 2km of the site. A single pond was identified within the proposed development site boundary, while nine ponds were identified within a 500m radius of the proposed development site, including two adjacent to the proposed development site on the north-west corner. Of these, the two ponds adjacent to the proposed development were considered to have the potential to support great crested newts; however, none were recorded during surveys. The nearest pond identified with records of great crested newt is located approximately 1.6km to the north of the proposed development and as such they are unlikely to be a constraint to the development.

9.3.6. There are no records of reptiles[3] within the proposed development site or immediately adjacent areas and the closest reptile record is of an adder (*Vipera berus*) 600m to the north. The habitats within the proposed development site are considered suboptimal for reptiles and, if any reptiles are present, these are likely to be in low numbers.

9.3.7. Eleven bird species listed on Schedule 1[4] have been identified within 2km of the proposed development site. None of the Schedule 1 species recorded are considered likely to be breeding on or adjacent to the proposed development and all are likely to be non-breeding visitors to the area. Breeding bird surveys have recorded five species listed as species of principal importance[1], these being: lapwing (*Vanellus vanellus*); linnet (*Carduelis cannabina*); skylark (*Alauda arvensis*); song thrush (*Turdus philomena*) and yellowhammer (*Emberiza citronella*). The breeding assemblage of birds is considered typical of the woodland and intensively managed arable habitats present.

9.3.8. At least eight bat species[5] have been recorded historically within the area, these being barbastelle (*Barbastellus barbastellus*), serotine (*Eptesicus serotinus*), Natterer's bat (*Myotis nattereri*), noctule (*Nyctalus noctula*), common pipistrelle (*Pipistrellus pipistrellus*), Nathusius' pipistrelle (*Pipistrellus nathusii*), soprano pipistrelle (*Pipistrellus pygmaeus*) and brown long-eared bat (*Plecotus auritus*). Activity and static detector surveys identified at least seven species (barbastelle, brown long-eared bat, common pipistrelle, *Myotis* spp., Nathusius' pipistrelle, noctule, and soprano pipistrelle) present within the proposed development site. Except for common and soprano pipistrelle activity, low levels of bat flight and foraging activity were recorded.

[1]Species of principal importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[2]Great crested newts are a European Protected Species (EPS), receiving protection under the Conservation of Habitats and Species Regulations (2017) (Ref. 9.3.2). They are also protected under the Wildlife and Countryside Act 1981 (Ref. 9.3.3) and are a species of principal importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[3]All UK species of reptiles are protected under the Wildlife and Countryside Act 1981, making it an offence to kill or injure these species. They are also species of principal importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[4]All wild birds, their eggs and nests are protected under Section 1 of the Wildlife and Countryside Act 1981. Certain species are also listed on Schedule 1 of the Wildlife and Countryside Act 1981, which affords them extra protection against disturbance whilst nesting.

[5]All species of bat in the UK are EPSs, receiving protection under the Conservation of Habitats and Species Regulations (2017). They are also protected under the Wildlife and Countryside Act 1981. Several bat species, including soprano pipistrelle, brown long-eared, noctule and barbastelle bat are species of principal importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006). Barbastelle bats are also listed in the European Commission (EC) Habitats Directive (1992) (Ref. 9.3.4, Annex II), requiring the establishment of SACs to conserve this species.

9.3.9. Assessment of trees with bat roost potential in the immediate vicinity of the proposed development site has identified ten trees with high potential and four trees with medium potential to support roosting bats, as well as a small number of trees with lower potential roost features. Whin Belt and other blocks of woodland adjacent to the development site are likely to provide a greater roost resource than the habitats within the development site.

9.3.10. Badger[6] (*Meles meles*), European otter[7] (*Lutra lutra*), water vole[8] (*Arvicola terrestris*), brown hare (*Lepus europaeus*) and Western European hedgehog (*Erinaceus europaeus*) are recorded as present within 2km of the proposed development site but there were no desk-study records of these species within or immediately adjacent to the proposed development site itself.

9.3.11. A badger sett, consisting of five active entrances and two disused entrances is present approximately 130m east of the proposed development site (but not within it) and there are other signs of activity along hedgerows in the area. Small numbers of brown hares were also recorded during a number of other ecological surveys (bird and bat surveys) undertaken within the proposed development site.

9.3.12. There are records of three notable, and/or legally protected, invertebrate species within 2km of the site but there are no records of these from within or adjacent to the proposed development site.

b) Environmental design and embedded mitigation

9.3.13. A summary of the measures that have been incorporated into the design of the proposed development and that would protect the existing features of ecological interest are set out below.

i) Construction

- Woodland blocks on the perimeter, including Whin Belt, would be retained in their entirety. There would be no direct loss of this habitat and its associated species.
- A buffer of 10m between the woodland and the development would be maintained. This buffer distance would help minimise any indirect impact on the woodlands associated with the proposed development (e.g. noise, lighting and anthropogenic disturbance).
- All boundary hedgerows would be retained, other than a short section approximately 50m in length, which would be lost at the location of the proposed access road. The direct loss of hedgerow habitat and its associated species would be minimised.
- The pond located within the proposed development site, close to the western boundary would be retained. There would be no direct loss of this habitat and its associated species.
- The Construction Environmental Management Plan (CEMP) will define any ecological constraints and specify any measures required during enabling works and construction in relation to the presence of protected species and any required vegetation clearance works. It would specify the need for an Ecological Clerk of Works to undertake and oversee specific tasks.
- The lighting design for the proposed development would comply with the lighting strategy and use light fittings chosen to limit stray light. These measures would minimise impacts on nocturnal species such as bats that may use the nearby tree lines or habitats for roosts or foraging.

ii) Operation

- A buffer of 10m between the woodland and the development would be maintained. This buffer distance would help minimise any indirect impact on the woodlands associated with the proposed development (e.g. noise, lighting and anthropogenic disturbance).
- 2-3m high grassed earthwork bunds would be located at the northern and southern extents of the site to aid in the screening of the proposed development from adjacent habitats.
- Soft landscaping for the proposed development would include grassed areas, and tree and shrub planting. These would be maintained for the lifetime of the development before being removed when the agricultural use is reinstated. A temporary SuDS would be implemented to minimise surface water run-off and prevent diffuse pollution from sediment arising. This design would include the incorporation of swales. These temporary landscape and surface drainage features would have temporary ecological benefits.
- Operational lighting would be designed to prevent spill and exposure on to surrounding habitats.

[6]Badgers are protected under the Protection of Badgers Act (1992).

[7]Otter is an EPS on Schedule 2 of the Conservation of Habitats and Species Regulations (2017) and protected under Schedule 5 and 6 of the Wildlife and Countryside Act 1981 and is included within Section 41 of the NERC Act (2006).

[8]Water vole is protected under Schedule 5 of the Wildlife and Countryside Act 1981 and included within Section 41 of the NERC Act (2006).

iii) Removal and reinstatement

9.3.14. Due to the nature of the restoration and reinstatements works, it is anticipated that the measures proposed in the CEMP for the construction phase would mitigate the potential impacts. When the facility has been removed, the area would be returned to its existing agricultural use. Hedgerows and trees would be replanted to replace any lost at the start of construction so as to return the site as close as possible to its pre-construction condition. No additional embedded mitigation is proposed during this phase.

c) Preliminary assessment of effects

9.3.15. Given the embedded mitigation measures proposed, this preliminary assessment only considers the habitats and species for which significant effects could occur. Where no significant effects are considered likely they are not considered further in the paragraphs below but are summarised in **Tables 9.3.1**, **9.3.2** and **9.3.3** and will be described within the ES submitted with the application for development consent as appropriate.

9.3.16. Despite the embedded mitigation measures included within the design, the potential for significant effects on bats cannot be excluded at this stage. A preliminary assessment of effects on this species group is provided below to better understand the effects, and to determine if further mitigation is required.

i) Construction

9.3.17. The construction of the proposed development would result in the temporary loss of arable land of negligible ecological value, the permanent loss of a short section of hedgerow (approximately 50m) of limited value, and permanent loss of three trees with the potential to support roosting bats. Construction could therefore have an effect on foraging, commuting and roosting bats and these impacts would occur over the duration of the construction period (approximately 16 months). However, habitat loss would be of sub-optimal habitats, given the higher quality habitats present in adjacent areas and that the number of bats recorded using these habitats in its current state is low. No significant effects on bat populations are expected as a result of habitat loss.

9.3.18. Bats are impacted by both increased noise levels and increased lighting but only a relatively small number of bats have been recorded within the proposed development site on any one occasion. Evidence suggests that bats using the site are not dependent on the habitats present and will also be using a range of additional habitats in the wider area. No significant effects on bat populations are expected as a result of construction noise or lighting; however, there is a potential need for close-boarded fencing to protect against noise.

ii) Operation

9.3.19. The extent of noise from the proposed development during operations is likely to be restricted to the footprint of the facility and habitats on the immediate boundary and the noise levels associated with the operation of the proposed development are predicted to be lower than those associated with the construction phase of the proposed development. No significant effects on bat populations are expected as a result of operational noise.

9.3.20. Other than for a short section of the access road (where it joins the A12), the operational development, designed in accordance with the lighting strategy, would not generate light spill above 1_{lux} outside of the proposed development site boundary. No significant effects on bat populations are expected as a result of operational lighting.

iii) Removal and reinstatement

9.3.21. During restoration of the land back to agriculture, the buildings, hard standing, site drainage and temporary landscaping would be removed, and the ecological impacts experienced would be very similar to those of construction. There would be some minor impacts arising as a result of the removal of temporary plantings associated with the landscaping of the site boundaries; however, no significant effects on bat populations are expected as a result of habitat loss, noise or lighting during this phase of development.

d) Additional mitigation and monitoring

9.3.22. The preliminary assessment of effects presented above identifies potentially significant effects on bats during construction. Additional measures to mitigate significant adverse effects may therefore be required.

9.3.23. Additional mitigation measures may also be required in relation to habitats and species for which a significant effect is not anticipated, but which are nonetheless legally protected, to ensure compliance with the legislation. Under the CEMP, pre-construction surveys will be required and may result in mitigation measures such as micro-siting of specific elements of the project and/or licences for protected species. Monitoring of mitigation measures may also be required to ensure their effectiveness. These measures would be presented in the ES, if relevant.

i) Construction

9.3.24. The proposed development includes the removal of several trees identified as having the potential to support roosting bats. Tree inspections would therefore be undertaken sufficiently in advance of tree felling to enable draft licence application(s) to be submitted with the application for development consent as required.

9.3.25. Consideration will be given to the use of close-boarded fencing along the internal side of the perimeter security fence where it abuts woodland blocks to provide lighting and noise mitigation.

9.3.26. The field margins of the proposed development have limited potential to support a small population of reptiles. Prior to the commencement of construction, any potential reptile refugia would be removed and a phased vegetation clearance process would also be undertaken to displace any reptiles from the proposed development site.

ii) Operation

9.3.27. Close-boarded fencing erected during the construction phase along the perimeter of the proposed development where it abuts areas of woodland would remain in place for the duration of the operational life of the development.

iii) Removal and reinstatement

9.3.28. No additional measures are proposed for this phase.

e) Preliminary assessment of residual effects

9.3.29. No significant residual effects on bat populations or any other species groups or habitats are expected for any phase of the development. The embedded mitigation measures would ensure that any potential for significant effects is removed and the additional mitigation measures described would ensure the legal requirements for protected species are met.

f) Completing the assessment

9.3.30. Once the proposals for the Sizewell C development as a whole are finalised, a full ecological assessment of the proposals will be undertaken as part of the EIA and the results presented in the ES. The ES will present the full assessment underpinning the conclusions drawn in relation to significant effects. The need to update some ecological surveys will be considered and surveys undertaken if required to ensure that the assessment is robust.

Table 9.3.1 Summary of effects for the construction phase

Terrestrial Ecology and Ornithology

Topic/receptor	Potential impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Non-statutory designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Hedgerows	Habitat loss	None required, area to be lost not considered significant.	Not significant	None required	Not significant
Reptiles	Habitat loss and incidental mortality.	Measures for reptile mitigation to be outlined in CEMP.	Not significant	Phased vegetation clearance and displacement of reptiles prior to construction.	Not significant
Breeding and wintering birds.	Loss of habitat for nesting and foraging.	Measures for nesting and wintering birds and vegetation clearance to be outlined in the CEMP. Retention of woodland blocks and maintenance of 10m buffer. Retention of majority of boundary hedgerows.	Not significant	Close-boarded fencing would be erected along the internal side of the perimeter security fence where it abuts woodland blocks.	Not significant
Bat assemblage	Habitat loss through loss of arable field, hedgerow and trees. Disturbance from noise and lighting.	Retention of woodland blocks (including Whin Belt) and maintenance of 10m buffer. Retention of majority of boundary hedgerows.	Not significant	Potential mitigation measures under Natural England licence. Close-boarded fencing would be erected along the internal side of the perimeter security fence where it abuts woodland blocks.	Not significant
Badgers	Loss and severance of habitat. Disturbance or damage to existing setts.	Measures to protect badgers from construction works to be detailed within CEMP.	Not significant	Potential mitigation measures under Natural England licence.	Not significant

Table 9.3.2 Summary of effects for the operational phase

Terrestrial Ecology and Ornithology

Topic/receptor	Potential impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Non-statutory designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Reptiles	Habitat severance and incidental mortality.	None required as impact not considered significant.	Not significant	None required	Not significant
Breeding and wintering birds.	No impact envisioned.	2-3m grassed earthwork bund located at the northern and southern extents. A buffer of 10m between the woodland and the development would be maintained.	Not significant	Close-boarded fencing would be retained along the internal side of the perimeter security fence where it abuts woodland blocks. Soft landscaping would include tree and shrub planting.	Not significant
Bat assemblage	Disturbance from noise and lighting.	Operational lighting strategy would be designed to minimise light spill. 2-3m high grassed earthwork bund located at the northern and southern extents. A buffer of 10m between the woodland and the development would be maintained.	Not significant	Close-boarded fencing would be retained along the internal side of the perimeter security fence where it abuts woodland blocks.	Not significant

Table 9.3.3 Summary of effects for the removal and reinstatement phase

Terrestrial Ecology and Ornithology

Topic/receptor	Potential impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Non-statutory designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Hedgerows	Habitat reinstatement.	Hedgerows lost to construction would be reinstated.	Not significant	None required	Not significant
Reptiles	Incidental injury and mortality.	Measures to protect reptiles from removal and reinstatement works detailed within Environmental Management Plan.	Not significant	None required	Not significant
Breeding and wintering birds.	No impact envisioned.	A buffer of 10m between the woodland and the development would be maintained.	Not significant	Close-boarded fencing and landscape planting would remain in place for as long as possible. Replanting of hedgerow and trees.	Not significant
Bat assemblage	Disturbance from noise and lighting.	A buffer of 10m between the woodland and the development would be maintained. Lighting strategy would be designed to minimise light spill.	Not significant	Potential mitigation measures under Natural England licence. Close-boarded fencing and landscape planting would remain in place for as long as possible. Replanting of hedgerow and trees.	Not significant
Badgers	Disturbance or damage to existing setts.	Measures to protect badgers from removal and reinstatement works detailed with Environmental Management Plan.	Not significant	Potential mitigation measures under Natural England licence.	Not significant

9.4. Amenity and recreation

9.4.1. The figure for amenity and recreation is presented in **Volume 3** as **Figure 9.4.1**.

a) Baseline environment

9.4.2. Amenity and recreation resources within the 1km study area comprise PRoWs and a cycle route passing through the rural, predominantly arable agricultural landscape. These are shown on **Figure 9.4.1**. The landscape is crossed by a network of roads and the A12 extends along the south-eastern edge of the site. Users of the following PRoW are likely to be affected to a greater degree; there are other recreational resources within the 1km study area but the proposed development is unlikely to be perceptible from these:

- Bridleway E-288/008/0. This bridleway crosses the south-western corner of the site in the vicinity of the proposed access road, running from the A12 to the B1116 for a length of approximately 1km. It passes along a farm track enclosed by trees and shrubs between the A12 and Whin Belt, continuing northwards between open fields to a woodland. It then turns west away from the site through the woodland, before following field boundaries to the B1116.
- Footpath E-387/008/0. This footpath runs from the A12 to Marlesford Road for a length of approximately 0.8km. It passes east of the site boundary north of the A12 and then runs across an arable field and along a farm track.
- Footpath E-288/016/0 and bridleway E-288/017/0. These lie south and east of the site, east of the A12. These two PRoWs provide a continuous route from the southern side of the A12 approximately 50m from the site to Ash Road, east of Lower Hacheston, for a length of approximately 0.6km. Footpath E-288/016/0 runs south-eastwards across an arable field from the A12 to Bottle and Glass Cottages, on land sloping north-westwards towards the site. The route then crosses a minor road and bridleway E-288/017/0 continues southwards, on land falling southwards away from the site to Ash Road.
- Footpaths E-178/002/0, E-178/003/0 and E-387/007/0. These lie approximately 0.45km east of the site, east of the A12. These footpaths provide a continuous route from Ash Road running north-east to Ivy House Farm at the A12 for a length of approximately 1.4km. They pass across arable fields and along field boundaries.

b) Environmental design and embedded mitigation

9.4.3. A number of mitigation measures have been identified and incorporated into the design for both the construction and operation phase of the proposed development. These measures would, where possible, be introduced at an early stage of the construction process and so contribute to the management and reduction of environmental effects for both construction and operational phases:

- 2-3m high grassed earth storage and screening mounds would be located along the southern, western and parts of the northern and eastern boundaries.
- Planting of vegetation between the site and the PRoWs and bridleway would help to soften the effects of the proposed development over time, including the screening mounding proposed around the perimeters of the site. An area of trees and scrub within the western edge of the site adjacent to bridleway E-288/008/0 would be retained.
- Measures to minimise noise and changes to air quality would be implemented as described in **section 9.7 Noise and vibration** and **section 9.8 Air quality** below.
- Temporary short-term closures and diversions of bridleway E-288/008/0 may be necessary while construction works occur. A safe crossing through the site and across the proposed access road would be provided during periods of closure.

c) Preliminary assessment of effects

i) Construction

9.4.4. Users of bridleway E-288/008/0 would be directly affected by the proposed development as it runs through and along the south-western boundary of the construction site. Users would have direct views into the site and would experience construction-related noise. There are likely to be temporary diversions during construction. Effects are likely to be significant and temporary. The bridleway is infrequently used.

9.4.5. Footpath E-387/008/0 would not be directly affected by the proposed development. Users would have views of the construction works. Noise effects are unlikely to be significant and similarly amenity effects are unlikely to be significant.

9.4.6. Users of footpaths east of the A12 would have views of and potentially hear noise from the construction works but these would be in the context of moving traffic and associated noise from the A12 and slip road to Wickham Market. Effects are unlikely to be significant.

9.4.7. Users of the PRoW are unlikely to experience changes to air quality caused by the proposed development and the amenity effects are unlikely to be significant.

ii) Operation

9.4.8. Noise levels from the park and ride facility are likely to be restricted to the footprint of the facility and receptors close to the site boundary. Noise levels associated with the operation of the proposed development are predicted to be lower than those associated with the construction phase and not significant in context of background noise from the A12 and slip road to Wickham Market.

9.4.9. Users of bridleway E-288/008/0 would experience changes to their views and noise levels during the operational phase, given that the PRoW passes through the site (crossing the proposed entrance road) and along the western site boundary. These changes are likely to be significant and temporary.

9.4.10. Users of footpath E-387/008/0 would have views into the operational site and are likely to experience some change to the noise levels from vehicles in the site. Effects are unlikely to be significant.

9.4.11. Users of the PRoW are unlikely to experience changes to air quality caused by the proposed development. Effects are unlikely to be significant.

9.4.12. Users of other PRoW are unlikely to experience significant effects.

iii) Removal and reinstatement

9.4.13. During restoration of the land back to agriculture, the buildings, hard standing, site drainage and temporary landscaping would be removed. Bridleway E-288/008/0 would be restored to a useable and appropriate surface and the amenity and recreation impacts experienced would be very similar to those of the construction phase. Effects on users of bridleway E-288/008/0 are likely to be significant and temporary.

9.4.14. Users of other PRoW are unlikely to experience significant effects.

d) Additional mitigation and monitoring

9.4.15. No additional mitigation is proposed.

e) Preliminary assessment of residual effects

9.4.16. During the construction, operational and post-operational stages of the proposed development there are likely to be significant residual effects on users of bridleway E-288/008/0. There are unlikely to be significant residual effects on users of other PRoW.

f) Completing the assessment

9.4.17. The ES would present a full amenity and recreation impact assessment underpinning the conclusions drawn above in relation to significant effects, updated where relevant to account for any design changes.

Table 9.4.1 Summary of effects for the construction phase and the removal and reinstatement phases

Amenity and recreation

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Users of bridleway E-288/008/0.	Physical changes to route. Changes to views and noise.	Retention of established vegetation. Earth storage and screening bunds. Measures to minimise noise and changes to air quality.	Significant	None	Significant
Users of other amenity and recreation resources.	Users of some PRoW are likely to experience changes to views and noise.	Retention of established vegetation. Earth storage and screening bunds. Measures to minimise noise and changes to air quality.	Not significant	None	Not significant

Table 9.4.2 Summary of effects for the operational phase

Amenity and recreation

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Users of bridleway E-288/008/0.	Changes to views and noise.	Retention of established vegetation. Planting. Screening through bunding and planting. Measures to minimise noise and changes to air quality.	Significant	None	Significant
Users of other amenity and recreation resources.	Users of some PRoW are likely to experience changes to views and noise.	Retention of established vegetation. Planting. Screening through bunding and planting. Measures to minimise noise and changes to air quality.	Not significant	None	Not significant

9.5. Terrestrial historic environment

9.5.1. The figure for terrestrial historic environment is presented in **Volume 3** as **Figure 9.5.1**.

a) Baseline environment

9.5.2. An archaeological Desk Based Assessment (DBA) was undertaken for the Wickham Market park and ride site in 2014. The DBA considered existing records of archaeological features and investigations as well as historic mapping, aerial photography and documentary sources. Searches of Suffolk Historic Environment Record (HER), Historic England's (HE) Archives Monuments Information England, and the National Heritage List for England were undertaken. A study area of 1km from the centre point of the site was used for the 2014 DBA.

9.5.3. Geophysical surveys were carried out in 2013 and 2014. The 2013 survey was undertaken on land to the south-west of the current proposed site. The survey identified a number of geophysical anomalies reminiscent of Late Iron Age and Romano-British settlement. The overlapping nature of the recorded anomalies suggested that several successive phases of activity were represented. Subsequently, and following discussion with Suffolk County Council Archaeological Service (SCCAS), EDF Energy carried out detailed geophysical survey across the arable fields to the east of the original proposed site. Rectangular ditched enclosures laid out alongside a possible trackway were recorded in the southern part of the site. A number of linear features shown on post-medieval maps were also recorded. The archaeological features were investigated during archaeological trial trenching in September and October 2016.

9.5.4. New searches of the datasets were undertaken in August 2018, taking in a 1km study area from the current proposed site boundary in order to ensure data was relevant and up to date. This section draws upon the conclusions of the archaeological trial trenching report, original DBA and updated datasets.

9.5.5. There are no designated heritage assets within the site, and no designated heritage assets would be directly affected by the proposed development.

9.5.6. There are 31 listed buildings within the study area; two are listed at Grade I – the Church of All Saints (LB 1199742) and Church of St Andrew (LB 1278312). Two are listed at Grade II* - Wickham Mill (LB 1198526) and Marlesford Hall (LB 1278408). The others are all listed at Grade II. Many of the listed buildings are at the north-east edge of Wickham Market, with others located within Marlesford and towards Hacheston. The structures are all modern or post-medieval and are village or farm houses, except for the group of mill buildings and the bridge at Wickham Mill.

9.5.7. There are eight HER records of archaeological remains within the site boundary, two of which relate to findings from recent archaeological excavations undertaken for the current proposed development (MSF35363, MSF34386). These comprise various cropmark enclosures thought to be associated with a Romano-British settlement that was partially excavated in 1973 (MSF13468) to the south of the current site. The remains of a possible 17th century house (MSF2430) also lie within the site boundary. In addition, close to the present road layout, which is incorporated into the site boundary, lie records of pottery dating to the Iron Age (MSF2425) and Early Saxon period (MSF2430); as well as a larger area relating to a possible Roman settlement, also represented by the other evidence for Roman activity within the site boundary.

9.5.8. Trial trenching observed further archaeological features which are discussed in the sections below.

9.5.9. Hedges which could be considered important under the Hedgerow Regulations 1997 (Ref. 9.5.1) comprise the hedgerow along the site boundary to the east and the hedgerow around the small enclosure in the south-west corner of the site, which are on boundaries shown on the Hacheston Tithe map of 1839 (Ref. 9.5.2). These are best considered as heritage assets of low significance for historic and aesthetic interest resulting from their contribution to historic landscape character.

i) Prehistoric

9.5.10. A group of flint artefacts (MSF21710) was recorded during a metal-detecting rally on the site of the former Romano-British settlement, approximately 300m west of the site.

9.5.11. Portable Antiquities Scheme (PAS) data records a number of further finds of flint objects from the study area, although these are not suggestive of any specific areas of past activity. The PAS data notes a greater number of late Iron Age artefacts, mainly found in geographical association with Romano-British material, presumably reflecting the survival of older cultural traditions, within the area of known Romano-British settlement.

9.5.12. Trial trenching in 2016 revealed features dating to the Iron Age, including two, or possibly three, cremation burials as well as ditches which most likely represent the pre-Roman field system within the area. These findings correlate with earlier excavations in the 1970s and suggest that the pre-Roman activity within the site represents funerary and agricultural features within the hinterland of the main settlement to the south.

ii) Romano-British

9.5.13. Elements of a Romano-British settlement, believed to be the Roman small town of Hacheston were partially excavated in 1973-4 in advance of the construction of the A12 Wickham Market bypass (MSF2426). Further artefactual material and structural remains has been observed to the south-west of the site between Wickham Market and the B1116/B1078, suggesting that this settlement extended some distance to the south and south-west of the site. Finds of a substantial quantity of Romano-British artefactual material have been reported in this area through the PAS. While this data is confidential, and details cannot be published, it is clear that this settlement was of considerable importance and extent, and that well-preserved archaeological remains are likely to survive. The Suffolk HER records several further Romano-British features elsewhere in the study area, including a possible Roman road, and a bronze lamp found close to Rookery Farm.

9.5.14. Cropmarks visible on aerial photography and subsequent geophysical survey demonstrated that further remains of the settlement partially excavated in 1973, comprising enclosures and building plots, were likely located in the fields immediately to the south-western part of the site.

9.5.15. Archaeological trial trench evaluation at the site in 2016 confirmed the presence of Roman remains. The northern part of the site comprised mainly field boundary ditches with relatively few cultural artefacts. The southern part of the site revealed larger finds assemblages and included evidence of middens, a pottery kiln, as well as walls, an oven and probable yard surface. The findings are suggestive of a quasi-industrial area to the north of the main settlement with a rectilinear field system further out. The evaluation identified several phases of Roman activity within the site, possibly suggesting a reorganisation of the land surrounding the main settlement site at least once during the Roman period.

iii) Early-medieval and medieval

9.5.16. The DBA did not identify any early-medieval remains within the site, although subsequent boundary revisions and updated data searches reveal a record for an early Saxon sunken featured building found during the 1973 excavations at the western edge of the current B1116/A12 roundabout. The Suffolk HER notes the documented site of an early-medieval Moot, or meeting place at Gallows Hill (MSF16999) approximately 450m west of the site. Excavation in advance of gravel quarrying observed a sunken-featured building, an inhumation burial and a ring-ditch of this period (MSF9695), and further records of finds of unstated artefactual material have been made nearby (e.g. MSF2439, MSF354). No remains dating to the early-medieval period were recorded during the 2016 trial trenching.

9.5.17. The site lies approximately 800m to the north-east of Wickham Market, which was the principal settlement within the study area during the medieval period. The 2014 DBA and updated data searches reveal a number of records dating to the medieval period, including small find scatters (e.g. MSF18305) at the southern edge of the study area. In the absence of further recorded settlement during this period, it is likely that the site was in predominantly agricultural use at this time. The post-medieval house recorded at the western edge of the central part of site (MSF2430) suggests the potential presence of an earlier farmstead in the south-west of the site.

9.5.18. Trial trenching uncovered medieval ditches in four trenches. Pottery found during the evaluation was largely dated to the later 11th to 14th centuries, with an absence of pottery dating to the 15th century. The lack of later pottery is noted as coinciding with the expansion of Wickham Market, which was granted a market in 1440. There may have been a degree of urbanisation and abandonment of some of the smaller farmsteads and settlements in the surrounding area during the later medieval period.

iv) Post-medieval and modern

9.5.19. The distribution of records of post-medieval remains reflects the existing settlement and agricultural geography. Geophysical survey identified linear anomalies consistent with the field boundaries and a footpath recorded on historic mapping.

9.5.20. The excavation of a possible post-medieval house (MSF2430) at the south-western corner of the site suggests that there was a farmstead here at this time. There is no evidence to suggest the presence of further archaeological remains of this period within the site.

9.5.21. PAS data notes a number of find spots of post-medieval material within the study area which are consistent with a pattern of chance loss and are not suggestive of any specific areas of past activity.

9.5.22. The listed buildings within the study area date from the post-medieval period, and again reflect the existing settlement and agricultural geography of the study area. Several of the listed buildings lie within the Wickham Market Conservation Area to the south-west of the study area, while others lie in and around Marlesford and Hacheston.

9.5.23. Further post-medieval features were identified in the HER search including Wickham Mill (MSF15172), a brickworks (MSF20205), and the Framlingham Branch line (MSF30012), again reflecting the agricultural and increasingly, albeit small-scale, industrial nature of the area. The most significant of these is Glevering Park (MSF12898), 600m west of the site, laid out for Chaloner Arcedeckne by Humphrey Repton. Elements of Repton's landscape design were intended to hide the view of the gallows at Gallow Hill from the dining room.

b) Environmental design and embedded mitigation

9.5.24. Disturbance or removal of archaeological heritage assets could give rise to loss of archaeological interest. Site selection has been undertaken to avoid, as far as possible, identified areas of greater archaeological potential: between Stage 1 and Stage 2 the location of the proposed development was moved to the north and east to avoid the most sensitive parts of the former Romano-British settlement. Extensive trial trenches have been undertaken to understand the sensitivity and location of significant archaeology within the current site boundary.

9.5.25. Change to setting arising from visibility of the proposed development and construction noise or changes to air quality could give rise to loss of, or harm to, heritage significance. Similarly, perceptual change to existing field boundaries and land use could give rise to harm to historic landscape character.

9.5.26. Hedgerows to the site boundary will be retained and bunding installed to screen views of the proposed development and minimise visibility of and noise from traffic movements within the site. In addition, the location of the site adjacent to the existing A12 slip road means that any perceptual effects from increased traffic movements would be minimised when compared to the existing baseline.

c) Preliminary assessment of effects

i) Construction

9.5.27. Intrusive groundworks would take place across the site, including topsoil stripping and sub-soil disturbance during the construction of the proposed site. Invasive works of this nature would adversely affect any surviving sub-surface archaeological remains, reducing or removing their ability to be further interpreted, resulting in the loss of archaeological interest.

9.5.28. DBA, geophysical survey and trial trenching have confirmed the presence of previously unrecorded archaeological remains on the site that are part of remains of Roman settlement and its Late Iron Age precursor which are of high significance for archaeological interest. Any archaeological remains within the site would be substantially disturbed, if not removed entirely by the proposed development, although the movement of the site during earlier phases of design iteration means that the most densely occupied and sensitive parts of the former settlement would be avoided. This would give rise to a medium magnitude of change which would, in the absence of further mitigation, be significant.

9.5.29. As part of the embedded mitigation, the surviving hedges to the site boundary will be, in the main, retained. The hedge around the small enclosure at the south-west corner of the site would be removed, resulting in the loss of any historic and aesthetic interest. As a result, the change is assessed as of medium magnitude, which would not give rise to a significant adverse effect.

9.5.30. An initial study has been undertaken to identify designated assets which have the potential to be affected by the proposed development in accordance with Step 1 of the HE guidance (Good Practice Advice in Planning Note 3) (Ref. 9.5.3), and full assessment will be presented to support the application for development consent. Any increase in the magnitude of change to setting during the construction over that experienced during the operation period would be limited, and the proposed construction programme is anticipated to be of short duration.

ii) Operation

9.5.31. Change to setting is considered here as a primarily operational effect, in that any lasting change would be discernible during the operation of the proposed development.

9.5.32. Disturbance of any archaeological remains within the site would have occurred, and been effectively mitigated, during construction. Therefore, no direct effects on heritage assets are anticipated during the operation of the proposed park and ride site.

9.5.33. Listed buildings within the study area would not be affected by the proposed development, as their setting is defined by relationship to adjacent buildings and agricultural land. Any perceptual change will be insufficient to give rise to adverse effects given the distance of the assets from the site, intervening planting and the existing A12.

9.5.34. The non-designated parkland at Glevering Hall is of medium significance for historic and architectural interests as a surviving example of a designed landscape which has been progressively altered to reflect fashion, utility and changing historical circumstances from the 18th century to the present. This area is contained within strong woodland planting which separates it from the surrounding countryside. Visibility of the proposed Wickham Market park and ride facility would be precluded, and the agricultural land between the asset and the site would serve as a perceptual buffer in passing views of the asset. Consequently, no perceptible change would arise in the setting of the asset and there would be no effect.

iii) Removal and reinstatement

9.5.35. Any disturbance of archaeological remains within the site would have occurred and been effectively mitigated during construction. Therefore, no adverse direct effects are anticipated during the removal of the facility.

9.5.36. The restoration of hedgerows which have been lost would result in the reversal of any loss of aesthetic interest, although the historic interest of restored hedgerows would remain somewhat diminished. The medium effect caused by the removal of elements of these hedgerows at construction would be reduced to very low on their restoration and the effect would not be significant.

9.5.37. The removal of the proposed development, the return of the site to agricultural use and the restoration of hedgerows which were removed at construction would effectively reverse any perceptual change in the historic landscape.

d) Additional mitigation and monitoring

9.5.38. Additional mitigation of direct effects on heritage assets would comprise the adoption of an agreed written scheme of archaeological investigation (WSI) to ensure that the archaeological interest of any significant deposits and features could be appropriately investigated, recorded and disseminated. This would ensure that the effect on buried archaeological remains from the proposed development could be adequately mitigated.

9.5.39. A suitable mitigation strategy and WSI will be agreed with SCCAS. Monitoring of the agreed programme of archaeological investigation would be carried out by SCCAS during the implementation of the scheme. Publication and popular dissemination of the results would allow any informative and historic value to be fully realised.

9.5.40. A settings assessment, which will be consulted on with HE and Suffolk Coastal District Council's Conservation Officer ahead of application for development consent, will be undertaken. It will consider heritage assets where setting may potentially be subject to effects, their current setting, the potential change, and the magnitude of effect the proposed development may have on their setting. Any mitigation required will also be consulted upon and will most likely comprise screening and landscaping.

e) Preliminary assessment of residual effects

9.5.41. The loss of archaeological interest through disturbance of archaeological remains within the site could have a significant adverse effect. However, following the implementation of an agreed scheme of archaeological investigation any residual effect is not expected to be significant.

9.5.42. No significant adverse effects arising from change to setting of heritage assets are anticipated.

f) Completing the assessment

9.5.43. Once the proposals for the site are finalised, an appropriate mitigation scheme for buried archaeological remains, will be agreed with SCCAS.

9.5.44. A full archaeological assessment of the proposals, including settings assessment, will be undertaken as part of the EIA and the results presented in the ES. The ES will present the full assessment underpinning the conclusions drawn in relation to significant effects, and would draw upon LVIA, noise, air quality and other assessments where appropriate.

Table 9.5.1 Summary of effects for the construction phase

Terrestrial historic environment

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Previously unrecorded archaeological remains.	Disturbance or removal as a result of topsoil stripping and subsoil disturbance.	None	Significant	Agreed written scheme of archaeological investigation to ensure that the archaeological interest of any significant deposits and features could be appropriately investigated, recorded and disseminated.	Not significant
Historic Hedgerows	Loss due to construction activities / location of park and ride.	Retain where possible.	Not significant	None	Not significant

Table 9.5.2 Summary of effects for the operational phase

Terrestrial historic environment

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Non Designated Parkland at Glevering Hall.	Change in setting due to presence of park and ride.	Provision of screening planting and retention of existing hedgerows.	Not significant	None	Not significant
Listed buildings within study area.	Change in setting due to presence of park and ride.	None	Not significant	None	Not significant

Table 9.5.3 Designated heritage assets within study area

Historic England List Entry	Name	Grade	Easting	Northing
1199742	Church of All Saints	I	631196	258502
1278312	Church of St Andrew	I	632329	258311
1030557	Bridge Farmhouse	II	630875	256548
1030559	The Rookery	II	631000	258039
1030838	240, High Street	II	630647	256615
1030839	Bridge 20m south of Wickham Mill (including attached railings)	II	630654	256589
1030843	183 and 187, High Street	II	630550	256429
1198662	181, High Street	II	630540	256418
1198671	201 and 203, High Street	II	630583	256453
1199354	36, Ash Road	II	631592	256564
1230835	Lodge at entrance to Marlesford Hall	II	632633	258384
1230836	17-19, Low Road	II	632735	258247
1230837	26 and 27, Low Road	II	632569	258296
1231063	April Cottage	II	632614	258284
1231065	Shadyside	II	632482	258234
1231066	Holly Cottages	II	632422	258215
1231067	9 and 10, Main Road	II	632753	257769
1231068	Bridge House	II	632710	257706
1231069	Bell Inn	II	632852	257795
1278281	Old Post Office	II	632708	257697
1278409	The Rectory	II	632413	258361
1278410	Poplar Farmhouse	II	632664	258280
1283798	Deben Lodge	II	630545	256454
1377140	The Chequers Inn	II	630509	256418
1377143	177-179, High Street	II	630524	256404
1377280	Ash Cottage	II	631452	256544
1377282	Former Steam Mill 20m south-east of Wickham Mill	II	630674	256590
1377285	Church Cottage	II	631158	258541
1392095	Mausoleum 25m north of Church of All Saints	II	631211	258538
1198526	Wickham Mill	II*	630656	256610
1278408	Marlesford Hall	II*	632345	258593

9.6. Soils and agriculture

9.6.1. The figures for soils and agriculture are presented in **Volume 3** as **Figures 9.6.1** to **9.6.3**.

a) Baseline environment

9.6.2. The site is underlain by an area mapped as the Crag Group (quaternary sand), with an overlying drift deposit of Lowestoft Formation (glacial outwash) (Ref. 9.6.1).

9.6.3. The soils on this site are slightly acid loamy and clayey soils with impeded drainage (Ref. 9.6.2; **Figure 9.6.1**). Drainage is described as being impeded slightly with land covered by such soils generally being under arable or grass production.

9.6.4. Published Agricultural Land Classification (ALC) maps (Ref. 9.6.3) show the site to be predominantly Grade 3 with Grade 4 land around the A12/B116 Junction (**Figure 9.6.2**).

9.6.5. Under the ALC system land is graded between Grade 1 and 5, with Grade 3 subdivided into 3a and 3b. Land in grades 1, 2 and 3a is considered to be "best and most versatile" land.

9.6.6. As no detailed ALC mapping was available for this site a detailed ALC survey was undertaken across part of the site (covering approximately 18 hectares (ha)) in August and November 2016. This survey found agricultural land in Grades 3a (4.91ha), 3b (7.23ha) and Grade 4 (5.86ha). The remaining land which has not been surveyed in detail is mapped just as Grades 3 or 4, based on available provisional ALC mapping.

9.6.7. Based on the overall provisional ALC mapping the areas, of land in each grade is shown in **Table 9.6.1** below.

Table 9.6.1 ALC grade distribution

ALC Grade	Area (ha)
3 (undifferentiated)*	23.34
Grade 4	2.78
Total	**26.11**

*Based on available provisional ALC maps, of which at least 4.91ha is Grade 3a, with 7.23ha Grade 3b and 5.86ha Grade 4.

9.6.8. Soil texture, according to the field survey undertaken, is generally relatively heavy, comprising medium to heavy clay loams and clays across much of the site. The soil will, therefore, become waterlogged at times and be slow to dry out, and thus can be difficult to handle particularly when in a plastic state. This relates to the water content at which a soil can be easily deformed, resulting in a risk of a loss of soil structure and a degradation of soil quality during handling.

9.6.9. At the time of the ALC survey, the surveyed part of the site was under arable production, part under cereal stubble and part under potato.

9.6.10. A landowner interview undertaken confirmed that the site forms part of a wider, predominantly arable land holding and comprises approximately 5% of the total land holding.

9.6.11. The rotations on the arable land are cereals, with the addition of potatoes and some vegetable crops. The land within the site boundary has access to irrigation (using abstraction from the River Deben and a bore hole, supported by a reservoir for winter abstraction and the farm's own irrigation plant).

9.6.12. The permanent grassland which forms part of the wider landholding is used to support a livery enterprise.

9.6.13. Arable operations are undertaken by a supplier on a contract farming basis.

9.6.14. The majority of farm buildings at Bridge Farm (the primary unit which lies to the south-west of the site) have been let for diversified enterprises, offices and storage. This includes a Play Barn Café at Bridge Farm and 15 residential properties let on assured shorthold, none of which have agricultural ties. Not including the Play Barn, the farm employs two people full time.

9.6.15. The Livery enterprise has capacity for 22 horses supported by a menage, field of jumps and free access around field margins. Livery is run on a DIY basis.

9.6.16. The site has areas under Higher Level Stewardship to 2023 comprising corners of nectar mix and wild bird mix cover (**Figure 9.6.3**). There are no areas under a Woodland Grant Scheme.

9.6.17. Crops are produced under standard farm assured standards (with no organic accreditation). The farm retains its shooting rights and has a small commercial shoot.

b) Environmental design and embedded mitigation

9.6.18. A summary of the measures that have been incorporated into the design of the proposed development and that would protect the existing features of soil and agricultural interest is set out below.

i) Construction

9.6.19. The sustainable re-use of the soil resource would be undertaken in line with the Construction environmental management plan for the Sustainable Use of Soil on Construction Sites (Ref. 9.6.4). This would be achieved by the development of a Soil Management Plan (SMP) identifying the soils present, proposed storage locations and handling methods and how the resource will be re-used. The SMP would form part of the CEMP. Measures which would be implemented include (but are not limited to):

- completion of a Soil Resources Survey and incorporate results into a SMP;
- link the SMP to the Site Waste Management Plan (SWMP);
- ensure soils are stripped and handled in the driest condition possible;
- confine vehicle movements to defined haul routes until all the soil resource has been stripped; and
- ensure physical condition of the entire replaced soil profile is sufficient for the post-construction use.

9.6.20. All soils would be stored away from watercourses (or potential pathways to watercourses) and any potentially contaminated soil would be stored on an impermeable surface and covered to reduce leachate generation and potential migration to surface waters.

9.6.21. Industry standard measures would be put in place to control pollution, including from fuel or chemical stores, silt-laden run-off or dust.

9.6.22. A considerate construction approach would be used to minimise potential impacts on the remainder of the landholding and on neighbouring landholdings during the construction phase. Toolbox talks would be used to inform all those working on the site of the requirements for soil handling and minimisation of disturbance to agricultural activities.

9.6.23. All fencing around the proposed development would be sufficient to resist damage by livestock and will be regularly checked and maintained in a suitable condition. Any damage to boundary fencing would be repaired immediately.

9.6.24. Measures contained in relevant Department for Environment, Food and Rural Affairs (Defra) and Environment Agency best practice guidance on the control and removal of invasive weed species would be implemented where appropriate.

9.6.25. Works would cease, and the Animal Health Regional Office would be advised, should animal bones be discovered which indicate a potential burial site.

9.6.26. All movement of plant and vehicles between fields would cease in the event of a disease outbreak and official Defra advice would be followed to minimise the biosecurity risk associated with the continuation of works.

9.6.27. In relation to temporary and permanent land take requirements EDF Energy would liaise with landowners to understand and where possible address their concerns.

ii) Operation

9.6.28. The measures described for the construction phase would be maintained throughout the operational phase, as appropriate.

iii) Removal and reinstatement

9.6.29. Following completion of construction operations all agricultural land taken temporarily taken would be fully reinstated as near as practically possible to its former condition. Topsoil would be prepared and seeded using an appropriate seed mix or returned immediately to cultivation depending on the time of year. Permanent surface water/ agricultural drains would be re-installed to reinstate any pre-existing field drainage systems to pre-construction condition.

c) Preliminary assessment of effects

9.6.30. The potential for significant effects on soils and agriculture is discussed in this section. The assessment of significance is based on the embedded mitigation measures outlined above being in place.

i) Construction

9.6.31. The proposals for this site would result in the temporary loss of up to 26.11ha of land from primary agricultural productivity for approximately ten years. Approximately 4.91ha of this land is currently known to comprise best and most versatile (Grade 3a).

9.6.32. Given the potential extent of best and most versatile land to be lost on a temporary basis this preliminary assessment considers that this would not be a significant temporary effect.

9.6.33. There would also be an impact on the agricultural enterprise because of the loss of a proportion of the productive land. This would be assessed on a case by case basis as required.

9.6.34. On the assumption that landowners' concerns are addressed, through appropriate mitigation, this preliminary environmental assessment considers that significant effects on the agricultural enterprise are unlikely to occur and so are not considered further.

ii) Operation

9.6.35. There would be no additional operational phase effects on the soil resource or agricultural enterprise.

iii) Removal and reinstatement

9.6.36. The buildings and associated infrastructure would be removed in accordance with a demolition plan, which would maximise the potential for re-use of building, modules and materials.

9.6.37. The area would then be returned to its existing use through a methodology defined in a restoration plan and contained within the SMP. The restoration of the land to its existing use would be considered to be a beneficial effect.

d) Additional mitigation and monitoring

9.6.38. There are no mitigation measures available for the loss of best and most versatile land. The effect would however be temporary and the land would be returned to agriculture post-operation.

e) Preliminary assessment of residual effects

9.6.39. The embedded mitigation measures would ensure that the potential for significant effects is removed with the exception of the loss of agricultural land for approximately ten years.

f) Completing the assessment

9.6.40. Once the proposals for the development as a whole are finalised, a full assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects. An ALC survey would be undertaken across the site to fully inform the assessment impacts. In addition, landowner interviews would be repeated to identify any changes in the operation of the agricultural business and extended to cover the highways improvement scheme.

Table 9.6.2 Summary of effects for the construction phase

Soils and agriculture

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Agricultural land	Temporary loss of up to 26.11ha of which at least 4.91ha is best and most versatile land.	The loss is temporary, and all land would be returned to agriculture (after 10 years).	Not significant	There are no additional mitigation measures available.	Not significant
Agricultural businesses	Temporary impact due to the loss of a proportion of the productive land.	EDF Energy will liaise with landowners to understand and address their concerns.	Not significant	No adverse significant effects identified; additional mitigation measures are therefore not required.	Not significant

Table 9.6.3 Summary of effects for the operational phase

Soils and agriculture

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Agricultural land	There are no impacts identified during the operational phase.				
Agricultural businesses	There are no impacts identified during the operational phase.				

9.7. Noise and vibration

9.7.1. The figure for noise and vibration is presented in **Volume 3** as **Figure 9.7.1**.

a) Baseline environment

9.7.2. There are four potential noise receptors in close proximity to the site. The locations of these receptors are shown in **Figure 9.7.1**. **Table 9.7.1** below shows the estimated baseline ambient noise levels at each of these, based on a combination of survey results from the closest survey locations and road traffic noise modelling (road traffic is the most significant noise source in the area).

Table 9.7.1 Day-time ambient noise levels

Receptor	Day-time ambient noise L_{Aeq}, dB
Ivy House Farm	50-55
Ash View, Lower Hacheston	50-55
Bottle and Glass Cottages	60-65
Rookery Farm, Hacheston	40-45

b) Environmental design and embedded mitigation

9.7.3. The standard of good practice outlined in 'British Standard BS5228-1 Noise: 2009 + A1 2014 – Code of Practice for noise and vibration control at open construction sites' (Ref. 9.7.1), would be followed. Embedded mitigation for the control of noise and vibration could include, but not be restricted to the following measures:

- selection of quiet plant and techniques in accordance with good practice in BS5228 for all construction, demolition and earth moving activities;
- selection of mechanical services (such as air handling units);
- switching off equipment when not required;
- use of reversing alarms that ensure proper warning whilst minimising noise impacts off-site; and
- provision of training and instruction to construction site staff on methods and techniques of working to minimise off-site noise and vibration impacts.

9.7.4. BS 5228-2 gives detailed advice on standard good practice for minimising impacts from construction vibration. It is expected that this will be set out in the CEMP and that it will be a requirement of the contractors to adhere to this.

9.7.5. EDF Energy would also have a system for the receipt and recording of any noise or vibration complaints from occupiers of noise sensitive receptors, and procedures for investigating as necessary upon those complaints.

c) Preliminary assessment of effects

9.7.6. Noise and vibration levels have been predicted by calculation and modelling. A "significant" effect has been identified where levels are predicted to exceed a specified threshold value. Appropriate threshold levels are based on various standards and a relevant guidance and depend on the type of source; the sensitivity of the receptors; the time of day when it might occur; and, in some situations, on the existing noise levels in the area.

i) Construction

9.7.7. Given the distances to the receptors from the main working areas during the construction phase, and the existing environmental conditions described above, the magnitude of noise and vibration impacts have been assessed to be negligible and the effects would therefore be not significant.

ii) Operation

9.7.8. It is expected there would be negligible noise effects during the operational period. The classification of effect with no additional mitigation is predicted to be below the lowest observable adverse effect level (LOAEL) for all parameters at all noise sensitive receptors during both day-time and night-time assessment periods. Vibration effects during the operational phase would be negligible and therefore not significant.

iii) Removal and reinstatement

9.7.9. The removal of the proposed development would include activities similar to those used in the construction, but would also include demolition of small buildings and structures as well as breaking and removal of paved surfaces. The potential effect is predicted to be below the LOAEL and therefore assessed as negligible.

d) Additional mitigation and monitoring

9.7.10. No additional mitigation measures are necessary during construction or operation of the site.

9.7.11. Routine monitoring would be carried out to a scheme to be agreed with local authorities. Provision would be made as necessary for monitoring of noise and vibration levels in the event of complaints being received from occupiers of noise sensitive receptors, or on request of the local authorities.

e) Preliminary assessment of residual effects

9.7.12. No significant effects are predicted during the construction, operation or removal and reinstatement phases.

f) Completing the assessment

9.7.13. Further assessment of impacts will be needed, including further consideration of the construction methodology, local topographical features and layouts. The ES will present a full noise and vibration assessment and will consider any new information such as amended design or construction methodologies which might be relevant, although it is anticipated that the assessment will support the preliminary conclusions drawn above.

Table 9.7.2 Summary of effects for the construction phase and the removal and reinstatement phases

Noise and vibration

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
All receptors	Noise and vibration effects.	Selection of plant and methodology in accordance with good practice.	Not significant	None	Not significant

Table 9.7.3 Summary of effects for the operational phase

Noise and vibration

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
All receptors	Noise and vibration from operation of park and ride facility.	None	Not significant	None	Not significant

9.8. Air quality

a) Baseline environment

9.8.1. The closest human receptors to the proposed development are Ash View, located at the eastern end of Main Road (approximately 270m west), Bottle and Glass Cottages on the opposite side of the A12 and other properties in Lower Hacheston and Hacheston to the south and north respectively.

9.8.2. There are no sites of nature conservation interest (i.e. international, European and nationally designated sites of ecological interest) within 350m of the proposed development site or routes used by construction traffic, and therefore no such sites are included in the construction phase air quality assessment for this facility. The nearest site designation is Sandlings Forest Site of Special Scientific Interest, but at approximately 5.5km away this is unlikely to be affected by the proposed development, so would be scoped out of consideration in the air quality assessment.

9.8.3. Suffolk Coastal District Council has declared two Air Quality Management Areas (AQMAs) within its boundary (Ref. 9.8.1), due to elevated monitored concentrations of ambient Nitrogen Dioxide (NO_2), the nearest of which is approximately 5.5km from the site, along the A12 at Stratford St. Andrew. A third AQMA, at Dooley Inn, was revoked in 2016.

9.8.4. The nearest monitoring data (for a pollutant relevant to the assessment) is approximately 2.5km east at the NO_2 diffusion tube on the A12 in Little Glemham (Ref. 9.8.2), which in 2016 (the most recently reported year) monitored a roadside NO_2 concentration of 14µg/m^3, well below the annual mean air quality strategy objective of 40µg/m^3 (Ref. 9.8.3). NO_2 concentrations are likely to be similar to this at the proposed development site, given the two locations share similar physical characteristics.

9.8.5. Background concentrations of NO_2 and Particulate Matter of a diameter of 10 microns or below (PM10) in 2018 at the proposed development were 7.9µg/m^3 and 14.8µg/m^3 respectively (Ref. 9.8.4), well below statutory objectives (Ref. 9.8.5, Ref. 9.8.6).

b) Environmental design and embedded mitigation

i) Construction

9.8.6. Embedded mitigation that has been assumed for the assessment of effects includes:

- site access would be located as far as practicable, and at least 10m, from receptors;
- concrete batching plant would be located as far as practicable, and at least 200m, from receptors; and
- mobile crushing & screening plant would be located as far as practicable and at least 200m from receptors.

9.8.7. Air quality impacts arising from the construction phase would be managed through a range of control measures detailed in a CEMP, supplemented by the measures appropriate to the level of risk designated to the proposed development under Institute of Air Quality Management (IAQM) guidance (Ref. 9.8.7).

ii) Operation

9.8.8. In the operational phase, junction improvements are proposed at two locations as follows:

- junction widening at the junction of B1078 and the unnamed road to the equestrian centre; and
- an entirely new T-junction at the junction of Easton Road and the B1116.

9.8.9. Road widening and passing places along narrow lanes are also proposed, to enable safe passing of traffic on existing single carriageway lanes.

9.8.10. These road improvement measures should serve to alleviate any congestion that could have been caused by the proposed development (both within the park and ride site, and the local network), therefore reducing the potential for an increase in emissions.

c) Preliminary assessment of effects

i) Construction

9.8.11. The potential impacts associated with the construction of the proposed development include fugitive emissions of dust, emissions from non-road mobile machinery on the site, emissions from HGVs accessing the site and emissions from vehicles carrying workers to and from the site. However, given that the location is relatively remote from most receptors and the embedded mitigation measures described above, the adverse effects would likely be negligible and would therefore not be significant for any of the proposed construction activities at the site.

9.8.12. The principal risk is anticipated to be related to earthworks, as this phase of construction can typically require a high volume of material to be moved. A high level of activity could potentially place the dust emissions category as 'Large' by IAQM classification, with the likelihood of a 'Medium' risk based on the number and sensitivity of local receptors. Each risk category has the potential to lead to proportional adverse, albeit temporary, impacts which have the potential to be significant without mitigation.

9.8.13. However, assuming all mitigation measures are effectively implemented and monitored through an effective CEMP, at the level recommended by the dust risk assessment, no significant dust effects resulting from demolition and construction activities are anticipated.

9.8.14. It is expected that the number of Heavy Duty Vehicle (HDV)[9] movements required to develop the site will not exceed the IAQM screening threshold of more than 100 Annual Average Daily Traffic (AADT) required for a detailed dispersion modelling assessment and there is therefore not likely to be a significant air quality effect.

ii) Operation

9.8.15. There is potential for increases in pollutant concentrations at sensitive receptors located along the local road network where there are increases in the numbers of vehicles using those roads. These would include vehicles accessing the site to utilise the facilities, and emissions from buses travelling between the site and the main development site.

9.8.16. Accordingly, IAQM guidance (Ref. 9.8.8) has been used to determine the necessity for an Air Quality Impact Assessment, and it is expected that the proposed development would require a detailed assessment, given an approximate AADT increase (dependant on strategy) of up to 1,700 vehicles using the site throughout the day. However, as baseline concentrations across most of the study area are low, there would unlikely be significant air quality effects.

9.8.17. There is an AQMA located at Stratford St Andrew, which is north along the A12 from the site. However, significant effects are not expected at this location, due to anticipated improvements in air quality expected in this location over time and with the proposed two-village bypass that would ensure that traffic from the site, once constructed, will not travel through this AQMA.

9.8.18. The principal benefit of the proposed development is an overall reduction in main development site related traffic numbers, thus alleviating congestion and reducing emissions within the residential areas close to the main development site.

iii) Removal and reinstatement

9.8.19. The effects would be similar to the construction phase and so are likely to be negligible and would not be significant.

d) Additional mitigation and monitoring

9.8.20. No significant adverse effects are predicted for any phase of development and no additional mitigation measures are therefore proposed.

e) Preliminary assessment of residual effects

9.8.21. No significant adverse residual effects are predicted during the construction, operation or removal and reinstatement phases.

f) Completing the assessment

9.8.22. Once the proposals are finalised, the potential air quality effects of the proposed development will be re-evaluated to confirm whether the preliminary conclusions presented above are applicable. The ES will present the full assessment considered necessary for the proposed development, underpinning the conclusions drawn in relation to the absence of significant effects.

9.8.23. **Table 9.8.1** and **Table 9.8.2** summarise the expected air quality effects of the proposed development.

[9] HDVs include buses >3.5 tonnes in weight

Table 9.8.1 Summary of effects for the construction and the removal and reinstatement phases

Air quality

Topic/receptor	Impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Construction Dust					
Human	Potential generation of nuisance dust.	As recommended in CEMP and appropriate to level of risk identified by IAQM criteria.	Considered likely to be 'Medium', risk, though not significant with implementation of the CEMP mitigation measures.	None	Not significant
Vehicle Emissions					
Human	Potential increase in emissions.	As recommended in CEMP.	Unlikely to meet IAQM screening criteria requiring assessment, and therefore not significant.	None	Not significant

Table 9.8.2 Summary of effects for the operational phase

Air quality

Topic/receptor	Impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Vehicle Emissions					
Human	Emissions at receptors.	Road improvement measures.	Not likely to be significant.	None	Not significant

9.9. Geology and land quality

a) Baseline environment

i) Geology

9.9.1. The following provides a summary of the geology and geological characteristics within the site and site vicinity:

- made ground: potentially present associated with fly-tipped waste and containers observed to be present on-site during a walkover, an earth bund along the southern boundary of the western field in the site, the disused sand pit in the south-west of the site, un-mapped farmer's tip's and the construction of the B1078 (Main Road), the B1078 slip road and the A12 within the south and south-west of the site;
- superficial deposits: Lowestoft formation comprising sands and gravels in the south-west and north-eastern sections of the site and clay in the centre of the site;
- bedrock: the Crag Group;
- important geological sites: none present;
- identified geological hazards: none present;
- mining, quarrying and natural cavities: none present;
- ground stability hazards: none present; and
- unexploded ordnance risks: low risk.

9.9.2. Borehole logs to the south of the site along the A12 indicate that superficial deposits of sand and gravel with occasional chalk are present immediately south of the site to a depth of 20m below ground level (m bgl). Bedrock was not encountered in the boreholes.

ii) Hydrology and hydrogeology

9.9.3. The following provides a summary of the hydrological and hydrogeological characteristics within the site and site vicinity:

- surface water features: A single pond is present on-site, a number are located outside of the site boundary, predominantly to the south-west and west of the site. A network of drains is present 250m south of the site, a drain is situated 310m west of the site boundary and a drainage ditch is present adjacent to the western boundary of the site. The River Ore is located 480m north-east of the site;
- superficial aquifer: the Lowestoft Formation is classified as a Secondary A Aquifer in the south-west and north-eastern sections of the site and as Secondary (Undifferentiated) Aquifer in the centre of the site;
- bedrock aquifer: the Crag Group is classified as a Principal Aquifer;
- groundwater vulnerability: the site contains soils of intermediate leaching potential;
- groundwater/surface water abstractions: there is one groundwater abstraction recorded 55m east of the site;
- groundwater/surface water discharge consents: one groundwater discharge consent for a farm (listed as no longer current) is present within 500m of the site. No further details are provided. Two surface water discharge consents are present within 500m of the site for the discharge of treated effluent from a sewage disposal works and a domestic property;
- pollution incidents: none present; and
- flood risk: low risk.

iii) Site history

9.9.4. The site currently supports agricultural land and has done since at least the 19th century. There are also several roads present on-site. A number of roads were upgraded and extended in the 1970s as part of the construction of the A12 within the south-west of the site. Historical mapping suggests that the site previously contained a barn and a sand pit. The areas surrounding the site have a similar land use including two sand pits to the north-east and the Great Eastern Railway 420m north-east of the site, which has now been dismantled. A number of residential properties and an electrical substation had been constructed to the south-west of the site by publication of the 1951 map.

iv) Landfills and waste management sites

9.9.5. There are no historical or currently authorised landfills or waste management sites located within 500m of the site.

v) Previous investigations

9.9.6. There have been no previous ground investigations undertaken at the site.

vi) Key hazards

9.9.7. Key hazards present within the site or in its vicinity include the following:

- containers noted to be present on-site, with unknown contents located in the disused sand pit area;
- made ground within the site associated with the disused sand pit, stockpiles and earth bund;
- fly-tipped waste noted to be present on-site;
- made ground associated with the construction of the B1078 (Main Road), A12 and B1078 slip road within the south and south-west of the site as well as activities associated with their operation;
- farmland (on-site and in the site vicinity) and the potential for unmapped farmers tips;
- made ground associated with the disused sand pits located 70m and 130m to the north-east;
- electrical substation located 250m south of the site;
- made ground associated with the former railway located 420m north-east and activities associated with its operation;
- made ground associated with construction of A12 to the south-west of the site as well as activities associated with their operation, and with residential properties within 250m of the site; and,
- changes in soil compaction, soil erosion and ground compaction.

vii) Summary of preliminary conceptual site model

9.9.8. A summary of potential contamination sources, pathways and receptors identified within the Preliminary Conceptual Site Model (PCSM) is provided in **Table 9.9.1**.

9.9.9. Potential receptors and pathways are shown in **Table 9.9.2**.

Table 9.9.1 Summary of preliminary conceptual site model

Potential source of contamination	Potential contamination	Approximate location
Beggar's Barn, historically present in the north-west of the site, previously used for cattle and dairy farming.	Metals, inorganics, fuels, oils and pesticides associated with various farming practices and stored on-site.	On-site
Made ground associated with the construction of the B1078 (Main Road), A12 and B1078 slip road within the south and south-west of the site as well as activities associated with their operation.	Fuels and oils attributed to spills from vehicles on the roads included within the site boundary, plus exhaust particulates. A range of inorganic and organic contaminants including the potential for asbestos and ground gas.	
Containers with unknown contents located in the disused pit area (i.e. IBC, drum, canister) which could have leaked or been spilled.	Metals, inorganics, fuels, oils and pesticides.	
Made ground associated with the disused sand pit in the south-west of the site (presumed to have been infilled) the stockpiles on-site, and the earth bund along the southern boundary of the western field.	Gas associated with biodegrading material and a range of inorganic and organic contaminants.	
Fly-tipped waste along the south-western and western boundaries.	Asbestos and a range of inorganic and organic contaminants.	
Farmland within site boundary. Potential for other un-mapped farmers tips.	Contamination risk from herbicides, pesticides, silage, effluent, and fuel oils. Risk of inorganic and organic contamination including metals and hydrocarbons, PCBs, asbestos, etc.	
Made ground associated with the construction of the A12 to the south-west of the site as well as activities associated with their operation, and with residential properties within 250m of the site.	Fuels and oils attributed to spills from vehicles on the roads included within the site boundary, plus exhaust particulates. A range of inorganic and organic contaminants including the potential for asbestos and ground gas.	Off-site
Electrical substation located 250m south of the site.	Oils, metals and PCBs.	
Farmland surrounding the site.	Fuels, oils and pesticides associated with various farming practices.	
Made ground associated with the former railway located 420m north-east and activities associated with its operation.	A range of organic contaminants including hydrocarbons, PCBs, PAHs, solvents and creosote; metals; and ash and fill used in the construction of the railway.	
Made ground associated with the disused sand pits located 70m and 130m to the north-east.	Ground gas and a range of inorganic and organic contaminants including the potential for asbestos.	

b) Environmental design and embedded mitigation

i) Construction

9.9.10. A summary of the measures that have been incorporated into the design of the proposed development and that would protect land quality during construction is set out below:

- A piling risk assessment in accordance with Environment Agency guidance may be required to ensure that piling techniques deemed appropriate are implemented at the site by identifying and managing potential risks as a result of creating pathways to the aquifer.
- The CEMP would specify measures required including the following:
  - minimising the area and duration of soil exposure and timely reinstatement of vegetation or hardstanding to prevent soil erosion and reduce temporary effects on soil compaction;
  - implementation of appropriate dust suppression measures to prevent migration of contaminated dust;
  - implementation of working methods during construction to ensure that there is no surface water run-off from the works into the proposed SuDs, adjacent surface watercourses/leaching into underlying groundwater in accordance with best practice;
  - implementation of appropriate pollution incident control e.g. plant drip trays and spill kits;
  - implementation of appropriate and safe storage of fuel, oils and equipment during construction; and
  - implementation of an appropriate Materials Management Plan (MMP) to document how the excavated materials would be dealt with and a verification plan would record the placement of materials at the site; and
  - implementation of a SWMP.
- Remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) would be undertaken if deemed necessary.

Table 9.9.2 Potential receptors and pathways

Receptor Group	Receptor	Principal Contaminant Migration pathways
Human health (on-site).	Construction/maintenance workers.	Dermal contact with and ingestion of contaminants in soils, soil-derived dusts and water.
	Users of the new park and ride site.	Inhalation of soil-derived dust, fibres, gas and vapours.
Human health (off-site).	Farmers on adjoining agricultural land.	Dermal contact with and ingestion of contaminants in soil-derived dusts and water that may have migrated off-site.
	Pedestrians/cyclists/horse riders accessing public bridleway and local roads.	Inhalation of soil-derived dust, fibres, gas and vapours which may have migrated off-site.
	Residents in local area.	
Controlled waters: groundwater (on-site and off-site).	Groundwater in Secondary A and Secondary Undifferentiated Superficial Aquifers.	Leaching of contaminants in soil to groundwater in underlying aquifers.
	Groundwater in Principal Bedrock Aquifer.	Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.
Controlled waters: surface waters (on-site and off-site).	Surface water bodies including ponds on-site and River Ore, ponds, ditches and drains off-site.	Lateral migration of contaminated groundwater with discharge to surface watercourses as base flow. Discharge of contaminants entrained in groundwater and/or surface water run-off followed by overland flow and discharge.
Property (on-site and off-site).	Existing on-site services and structures on-site and off-site and proposed on-site services and structures.	Direct contact of contaminants in soil and/or groundwater with existing and proposed structures and buried services. Migration of contaminated groundwater, ground gas and/or vapours along strata and preferential pathways such as service routes or differentially permeable strata.
	Crops and livestock.	Direct contact, ingestion, inhalation and uptake of soil and water contamination by crops and/or livestock. Migration of contaminated waters/dust/fibres and subsequent uptake by crops or ingestion/inhalation/dermal contact by livestock.

- Gas protection measures would be incorporated within proposed structures, if monitoring and risk assessments deem them to be necessary.
- Hydroseeding of the earth bunds would be used to reduce soil erosion and dust.
- Design of the road and car parking areas and the selection of construction materials would be in accordance with good practice at the time of the design. The design would be required to take into account the ground conditions including the potential for ground movement, compaction, ground gas and ground aggressivity.
- Design of the swales and ponds would consider the ground conditions including the permeability of the strata and the relative level of contamination present on-site.

ii) Operation

9.9.11. A summary of the measures that shall be incorporated into the operational phase of the proposed development and that would protect land quality is set out below:

- The proposed development would be operated in accordance with the relevant regulations, good practice and pollution prevention including:
  - the construction of hardstanding to avoid spills and leaks;
  - the incorporation of petrol/oil interceptors within the drainage design where considered necessary;
  - the use of appropriate SuDs schemes (see **Surface water**, **section 9.11**); and
  - connection into the local foul water system or the use of a septic tank with all associated permits in place for foul water.

iii) Removal and reinstatement

9.9.12. A summary of the measures that have been incorporated into the removal and reinstatement of the proposed development and that would protect land quality is set out below:

- the use of a CEMP as detailed above to cover the removal of the park and ride infrastructure, the drainage infrastructure and the reinstatement of topsoil;
- implementation of a SWMP and removal of all wastes from site;
- use of a MMP to allow suitable materials to be placed back on-site;
- validation of the site and comparison against baseline conditions to assess the contamination status of the site following operation; and
- remediation of soil and groundwater contamination (e.g. source removal, treatment or capping) if deemed necessary.

c) Preliminary assessment of effects

i) Construction

Ground contamination

9.9.13. The construction works could potentially introduce new sources of contamination and disturb any existing sources of contamination through excavation and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off and ground gas migration pathways. With the embedded mitigation measures in place, construction activities should not increase the contamination risks presented at the site and a neutral to moderate beneficial effect is predicted.

9.9.14. Effects associated with human health and crops/ livestock would be beneficial and significant. Effects associated with controlled water and services would not be significant.

9.9.15. A preliminary assessment of the effects during the construction phase is provided in **Table 9.9.3** below.

Table 9.9.3 Summary of effects for the construction phase

Receptor	Value/ Sensitivity	Baseline risk	Construction risk	Effect
Human	High	Moderate/Low	Very low	Significant (beneficial)
Controlled waters (groundwater).	Medium	Moderate/Low	Low	Not significant
Controlled waters (surface water).	Low	Low	Very low	Not significant
Property (existing and future structures and services).	Low	Very low	Very low	Not significant
Property (crops and livestock).	Medium	Moderate/Low	Very low	Significant (beneficial)

Physical effects

9.9.16. The development may also cause physical effects including changes in soil erosion associated with stripping of topsoil, vegetation clearance, stockpiling, earthworks and construction of the new infrastructure.

9.9.17. Earthworks including areas for temporary works are anticipated for the construction of the park and ride and topsoil would be stockpiled in bunds around the site. There is the potential for increased soil erosion and run-off with a high sediment load likely to impact local surface waters. Earthworks would be planned to minimise soil exposure as far as practicable and areas required for temporary works would be reinstated as soon as possible after they are no longer required. With embedded mitigation, the effects on soil erosion are considered to be temporary and neutral and would not be significant.

9.9.18. With embedded mitigation, the physical effects would not be significant.

ii) Operation

Ground contamination

9.9.19. The operation of the park and ride would potentially introduce new sources of contamination. Spillages and leaks may occur and below ground services could create additional potential pathways for the migration of potential contamination that were not present at baseline. With embedded mitigation, effects would not be significant.

9.9.20. Effects associated with human health and crops/ livestock would be significant. Effects associated with controlled water and services would not be significant.

9.9.21. Effects during the operational phase are provided in **Table 9.9.4** below.

Physical effects

9.9.22. Impacts in relation to physical effects including soil erosion, compaction and changes in soil stability would be mainly related to the construction phase of the development and there are not considered to be any significant effects during the operational phase.

iii) Removal and reinstatement

Ground contamination

9.9.23. Predicted effects during the removal and reinstatement are provided in **Table 9.9.5**.

Table 9.9.4 Operational phase effects for the proposed development

Receptor	Value/ Sensitivity	Baseline risk	Operation risk	Effect
Human	High	Moderate/Low	Very low	Significant (beneficial)
Controlled waters (groundwater).	Medium	Moderate/Low	Low	Not significant
Controlled waters (surface water).	Low	Low	Very low	Not significant
Property (existing and future structures and services).	Low	Very low	Very low	Neutral
Property (crops and livestock).	Medium	Low	Very low	Significant (beneficial)

Table 9.9.5 Removal and reinstatement effects for the proposed development

Receptor	Value/ Sensitivity	Baseline risk	Post operation risk	Impact effect
Human	High	Moderate/Low	Low	Not significant
Controlled waters (groundwater).	Medium	Moderate/Low	Low	Not significant
Controlled waters (surface water).	Low	Low	Very low	Not significant
Property (existing and future structures and services).	Low	Very low	Very low	Neutral
Property (crops and livestock).	Medium	Moderate/Low	Very low	Significant (beneficial)

9.9.24. The proposed development would be re-instated to the existing condition. With embedded mitigation incorporated into the design and effectively implemented during the construction and operation of the proposed development, there would be a neutral to moderate beneficial effect as any existing contamination is likely have been removed during construction.

9.9.25. Effects associated with crops/livestock would be significant and beneficial given that any existing contamination is likely have been removed during construction. Effects associated with human health, controlled water and services would not be significant.

Physical effects

9.9.26. Impacts in relation to physical effects including soil erosion, compaction and changes in soil stability would be mainly related to the construction phase of the development and there are not considered to be any significant effects during the removal and reinstatement.

d) Additional mitigation and monitoring

9.9.27. The preliminary assessment of effects presented above identifies no adverse significant effects during construction, operation or post-operation in relation to land quality. Additional measures to mitigate significant adverse effects are not therefore required.

e) Preliminary assessment of residual effects

9.9.28. No additional mitigation is proposed beyond the embedded measures described above and the residual effects for all phases of development would remain the same as those described above in the preliminary assessment of effects.

f) Completing the assessment

9.9.29. Once the proposals for the Sizewell C Project as a whole are finalised, a full land quality assessment of the proposals will be undertaken as part of the EIA and the results presented in the ES. The ES will present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 9.9.6 Summary of effects for the construction phase

Geology and land quality

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Ground contamination: current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Risk assessment to define risks and undertake remediation if required. The CEMP would include mitigation measures.	Significant (beneficial)	Not required	Significant (beneficial)
Ground contamination: controlled waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant		Not significant
Ground contamination: property receptors (services/structures).	Contamination from on-site sources.		Not significant		Not significant
Ground contamination: property receptors (crops and livestock).	Contamination from on-site sources.		Significant (beneficial)		Significant (beneficial)
Physical effects: ground conditions.	Soil erosion impacts.		Not significant		Not significant

Table 9.9.7 Summary of effects for the operational phase

Geology and land quality

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Ground Contamination: Current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Construction methodology and associated mitigation measures would prevent impacts during operation. Facility operated in accordance with good practice.	Significant (beneficial)	Not required	Significant (beneficial)
Ground Contamination: Controlled Waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant		Not significant
Ground Contamination: Property receptors (services/ structures, crops and livestock).	Contamination from on-site sources.		Not significant		Not significant
Ground Contamination: Property receptors (crops and livestock).	Contamination from on-site sources.		Significant (beneficial)		Significant (beneficial)
Physical Effects: Ground conditions.	Soil erosion impacts.		Not significant		Not significant

Table 9.9.8 Summary of effects for the removal and reinstatement phase

Geology and land quality

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Ground contamination: Current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Incorporate mitigation measures into the CEMP, including the adoption of working methods to appropriately manage dust generation, pollution incidents, surface water run-off and groundwater during deconstruction/ demolition. Validation of the site and remediation of soil/groundwater contamination if necessary.	Not significant	Not required	Not significant
Ground contamination: controlled waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant		Not significant
Ground contamination: property receptors (services/structures).	Contamination from on-site sources.		Not significant		Not significant
Ground contamination: property receptors (crops and livestock).	Contamination from on-site sources.		Significant (beneficial)		Significant (beneficial)
Physical effects: ground conditions.	Soil erosion and impacts.		Not significant		Not significant

9.10. Groundwater

a) Baseline environment

9.10.1. Details on the geology of the site are provided in the **Geology and land quality section 9.9** above.

9.10.2. The sand and gravel of the Lowestoft Formation in the east and west sections of the site is classified as a Secondary A Aquifer[10] and the diamicton of the Lowestoft Formation in the centre of the site is classified as a Secondary Aquifer (undifferentiated)[11] (Ref. 9.10.1).

9.10.3. The Crag Group bedrock underlying the site is classified as a Principal Aquifer[12].

9.10.4. The site is within the total catchment (Zone 3)[13] of a groundwater Source Protection Zone (SPZ)[14]. The inner protection zone (Zone 1)[15] is approximately 500m south of the site.

9.10.5. Contours shown on British Geological Survey (BGS) hydrogeological mapping (Ref. 9.10.2) suggests that Crag groundwater levels at the site are around 7m above Ordnance Datum (approximately 20m bgl). These contours are based on data from 1976 and are only indicative of current levels; however, the hydrogeological regime is not considered likely to have changed significantly in the intervening years.

9.10.6. The diamicton of the Lowestoft Formation at the site is expected to be of relatively low permeability and therefore have a limited hydraulic connection to the underlying Crag groundwater. It is likely there are perched water tables in permeable lenses within the Lowestoft Formation.

9.10.7. The site is located on the Waveney and East Suffolk Chalk and Crag groundwater body (Water Framework Directive - reference GB40501G400600) (Ref. 9.10.3). This groundwater body has been classified by the Environment Agency as being of Poor Quantitative and Poor Chemical status, with an objective to achieve Good Quantitative status by 2027. The Poor Chemical status is attributed to impacts from agriculture as evidenced by elevated nitrate concentrations in groundwater. The site is located within a groundwater Nitrate Vulnerable Zone.

9.10.8. Three medium sized abstractions are indicated within 1km of the site, located 60m east, 630m south-east, and 650m north of the proposed development, respectively (Ref. 9.10.4). Maximum annual abstractions range between 31,700 and 135,000m^3 and the purpose for each of these abstractions is for general agriculture (spray irrigation).

9.10.9. Given the depth to groundwater it is not considered there is a connection between groundwater and surrounding surface water features. Surface water features are discussed further in **Surface water**, **section 9.11** below.

9.10.10. The Suffolk Coastal and Waveney District Strategic Flood Risk Assessment makes no reference to groundwater flooding across the Suffolk Coastal and Waveney District (Ref. 9.10.5). Flood risk is discussed further in **Flood risk**, **section 9.12** below.

9.10.11. There is no known existing land contamination on the site. Further information on land quality is presented in **Geology and land quality**, **section 9.9** above.

9.10.12. There are no designated ecological sites on or within 1km of the site (Ref. 9.10.6).

b) Environmental design and embedded mitigation

i) Construction

9.10.13. Early in the construction phase, bunds and ditches would be used as appropriate to ensure that surface water run-off would be contained within the site and infiltrated into the underlying strata and off-site run-off that would otherwise enter the site is captured.

9.10.14. A piling risk assessment, in accordance with Environment Agency guidance, may be required to ensure that appropriate piling techniques would be implemented at the site (by identifying and managing potential risks as a result of creating pathways to groundwater).

9.10.15. The CEMP would specify measures required during enabling works and construction which include but are not limited to:

[10]Secondary A Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

[11]Secondary (Undifferentiated) Aquifers are designated in cases where it has not been possible to attribute either category Secondary A or Secondary B to a rock type.

[12]Principal Aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

[13]Total catchments (Zone 3) are defined as the total area needed to support the abstraction or discharge from the protected groundwater source.

[14]Groundwater Source Protection Zones are areas defined around groundwater sources used for public drinking water supply. The SPZ shows the risk of contamination from activities that might cause pollution in the area. The closer the activity, the greater the risk.

[15]Inner Protection Zones (Zone 1) are defined by a travel time of 50-days or less from any point within the zone at, or below, the water table. Additionally, the zone has as a minimum a 50m radius. It is based principally on biological decay criteria and is designed to protect against the transmission of toxic chemicals and water-borne disease.

- implementation of working methods during construction, to ensure there would be no surface water run-off from the works into adjacent surface watercourses/leaching into underlying groundwater, in accordance with best practice; implementation of appropriate pollution incident control e.g. plant drip trays and spill kits;
- implementation of appropriate and safe storage of fuel, oils and equipment during construction;
- implementation of an appropriate Materials Management Plan (MMP) to document how the excavated materials will be dealt with; and
- implementation of a Site Waste Management Plan (SWMP).

9.10.16. Remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) and ground stabilisation/improvement works would be undertaken if further investigation and risk assessments deemed it necessary.

9.10.17. The drainage/flood prevention strategies will consider the ground conditions including the permeability of the strata and the level of contamination present on-site.

ii) Operation

9.10.18. Appropriate drainage would be used, including the incorporation of SuDS measures where appropriate. This is likely to include provision of some permeable surfaces, swales and detention ponds.

9.10.19. Petrol/oil interceptors would be incorporated within the drainage design where considered necessary.

9.10.20. Foul sewage from the operational facility would be collected and would either pass through a septic tank or a package treatment works prior to its discharge.

iii) Removal and reinstatement

9.10.21. Once the need for the facility has ceased, the buildings and associated infrastructure would be removed which would maximise the potential for re-use of materials. When the site has been cleared, the area would be returned to its current existing agricultural use.

9.10.22. The removal of the proposed development would include the removal of any related drainage and SuDS measures. Any measures used to protect groundwater during construction would also be applied during the removal and reinstatement phase.

c) Preliminary assessment of effects

i) Construction

9.10.23. Assuming no piling is required and given the shallow excavation depths and low permeability of the superficial deposits at the site, the construction phase of the development would not likely have an impact on the groundwater level and flow regime.

9.10.24. Were a spill or leak to occur during construction, the impact on groundwater within superficial deposits would be low. The effect on the Lowestoft Formation sand and gravel aquifer and on groundwater within the Lowestoft diamicton would not be significant.

9.10.25. The Crag groundwater would be protected from any spills or leaks where it is overlain by low permeability superficial deposits. In areas where the Crag is overlain by sand and gravel of the Lowestoft Formation there is a potential pathway for contamination. However, given the relatively low volumes of potentially contaminative material, the scale of any spill or leak would be small; the impact on the Crag groundwater would be low and the effect not significant.

9.10.26. Considering both the baseline conditions of the site and the environmental design and embedded mitigation, there would be no significant adverse effects on groundwater at the site.

ii) Operation

9.10.27. The proposed works would not significantly increase the impermeable area of ground cover at the development site. The parking areas would predominantly be covered with permeable surfaces and water falling onto impermeable surfaces would be channelled into SuDS infrastructure. This would allow infiltration to the superficial aquifer and would mean that, although the spatial distribution of infiltration would be changed by the development, the total volume of infiltration entering the ground would not be significantly changed.

9.10.28. The main risks from contamination would arise from fuel spills or leaks within the main car parks. It is not anticipated that significant spills or leaks would occur from vehicles used for commuting purposes. Silt traps and hydrocarbon interceptors would likely be required for some areas of the site drainage system to prevent the supply of sediment and other contaminants to the surface drainage network. The provision of appropriate SuDS would protect the underlying groundwater from hydrocarbon contamination.

9.10.29. Considering both the baseline conditions of the site and the environmental design and embedded mitigation, there would be no significant effects on groundwater at the site.

iii) Removal and reinstatement

9.10.30. Considering both the baseline conditions of the site and the environmental design and embedded mitigation, there would be no significant effects on groundwater at the site.

d) Additional mitigation and monitoring

9.10.31. Periodic inspection and maintenance of the drainage infrastructure would be required to ensure its continued efficacy.

e) Preliminary assessment of residual effects

9.10.32. There are not expected to be any significant adverse residual effects during the construction, operation or removal and reinstatement phases.

f) Completing the assessment

9.10.33. Once the proposals for the Sizewell C development as a whole are finalised, a full groundwater assessment of the proposals will be completed as part of the EIA and the results presented in the ES. The ES will present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 9.10.1 Summary of effects for the construction phase

Groundwater

Receptor	Impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effect
Crag groundwater (Principal Aquifer). Lowestoft Formation sand and gravel (Secondary A Aquifer). Lowestoft Formation diamicton (Secondary Aquifer (undifferentiated)). Groundwater abstractions (within 1km of site boundary).	Leaching and migration of existing contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers.	Piling risk assessment (if required). Ensuring all site activities are carried out in accordance with the CEMP. Remediation of on-site contamination if required. Appropriate drainage design.	Not significant	Not required	Not significant
	Migration of contaminants via preferential pathways to deeper groundwater.		Not significant		Not significant
	Construction materials and the use of construction vehicles have the potential to introduce contamination to groundwater via drips and spillages and infiltration of run-off from the construction site.		Not significant		Not significant

Table 9.10.2 Summary of effects for the operational phase

Groundwater

Receptor	Impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effect
Crag groundwater (Principal Aquifer). Lowestoft Formation sand and gravel (Secondary A Aquifer). Lowestoft Formation diamicton (Secondary Aquifer (undifferentiated). Groundwater abstractions (within 1km of site boundary).	Increase in the impermeable area of ground cover at the development site.	Water draining from the car parking areas would pass through appropriate drainage, including the incorporation of SuDS and petrol/oil interceptors where necessary. This would allow infiltration to the superficial aquifer, whilst also protecting the underlying groundwater from hydrocarbon contamination.	Not significant	Periodic inspection and maintenance of the SuDS infrastructure.	Not significant
	Fuel spills or leaks within the car parking or bus parking areas infiltrating to groundwater.		Not significant		Not significant

Table 9.10.3 Summary of effects for the removal and reinstatement phase

Groundwater

Receptor	Impact	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effect
Crag groundwater (Principal Aquifer). Lowestoft Formation sand and gravel (Secondary A Aquifer). Lowestoft Formation diamicton (Secondary Aquifer (undifferentiated). Groundwater abstractions (within 1km of site boundary).	Leaching and migration of existing contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers.	Ensuring all site activities are carried out in accordance with the CEMP. Remediation of on-site contamination if required. Appropriate drainage design.	Not significant	Additional mitigation measures are not required.	Not significant
	Migration of contaminants via preferential pathways to deeper groundwater.		Not significant		Not significant
	Construction materials and the use of construction vehicles have the potential to introduce contamination to groundwater via drips and spillages and infiltration of run-off from the construction site.		Not significant		Not significant

9.11. Surface water

a) Baseline environment

i) Surface water features

9.11.1. The proposed development is located on the watershed between the River Deben and the River Ore. Light Detection and Ranging (LiDAR) data show that the highest ground levels, slightly above 29m Ordnance Datum Newlyn (ODN), are located in the north-east corner of the site. Ground levels lower towards the south and west of the site, with the lowest ground levels slightly below 25m ODN at the south-west edge.

9.11.2. The River Deben is located approximately 800m south-west of the proposed development at its closest point. The B1116 road separates the proposed development from this watercourse. The Environment Agency's Catchment Data Explorer (Ref. 9.11.1) defines the reach in the vicinity of the site as Deben (Brandeston Bridge - Melton) water body (water body reference GB105035046310).

9.11.3. The River Ore is located approximately 475m north-east of the proposed development at its closest point. A dismantled railway line and Marlesford Road separate the proposed development and this watercourse. The Environment Agency's Catchment Data Explorer (Ref. 9.11.2) defines the reach in the vicinity of the site as the Ore water body (water body reference GB105035045970).

9.11.4. There are several ponds in the vicinity of the Wickham Market park and ride site, including one pond within the red line boundary of the site located to the south of Whin Belt, and two ponds adjoining the site in the unnamed woodland to the north-west of the site.

ii) Fluvial geomorphology

9.11.5. Geomorphology and hydromorphology are key factors contributing to whether a water body can achieve or maintain Good Ecological Status.

9.11.6. The River Deben (Brandeston Bridge - Melton) water body (water body reference GB105035046310) is designated as a heavily modified water body. The geomorphology and the hydrological regime of the River Deben are of sufficient quality to support Good Ecological Status.

9.11.7. The geomorphology of the River Ore is sufficient to support Good ecological status; however, the hydrological regime 'Does not support good'. In lowland rivers where the hydrological regime does not support good, this is typically due to the effect of surface water or groundwater abstraction.

iii) Water quality

9.11.8. Physico-chemical and chemical data presented on Catchment Data Explorer have been reviewed for the Rivers Deben and Ore in the vicinity of the proposed site boundary. Chemical status for both rivers is Good.

9.11.9. Physico-chemical data indicate that the River Deben in the vicinity of the site boundary is at Good or High status for ammonia, Biochemical Oxygen Demand, dissolved oxygen, pH and temperature, and are not adversely affected by pollutants such as copper, iron, zinc and various pesticides. The water body is at Moderate physico-chemical status as a result of high phosphate concentrations. This suggests that water quality in the catchment is generally good, although it is limited by high nutrient loadings from agricultural run-off and/or treated sewage effluent.

9.11.10. Physico-chemical data for the River Ore indicate that the river is also at Good or High status for all quality elements, with the exception of phosphate, which is at Poor status. This is likely to be a result of high nutrient loadings from agricultural run-off and/or treated sewage effluent.

b) Environmental design and embedded mitigation

i) Construction

9.11.11. Early in the construction phase, bunds and ditches would be used as appropriate to ensure that surface water run-off would be contained within the site and infiltrated into the underlying strata and off-site run-off that would otherwise enter the site is captured.

9.11.12. Mitigation measures would be incorporated into the CEMP for the construction process, and could include (but are not limited to):

- The wheels of all vehicles would be washed before leaving site.
- Concrete and cement mixing and washing areas would be situated at least 10m away from surface water receptors. These would incorporate settlement and recirculation systems to allow water to be re-used. All washing out of equipment would be undertaken in a contained area and collected for off-site disposal.
- All fuels, oils, lubricants and other chemicals would be stored in an impermeable bund with at least 110% of the stored capacity. All refuelling would take place in a dedicated impermeable area, using a bunded bowser. Biodegradable oils would be used where possible.

- Spill kits would be available on-site at all times. Sand bags or stop logs would also be available for deployment on the outlets from the site drainage system in case of emergency spillages.

ii) Operation

9.11.13. The operational drainage system would incorporate SuDS measures to minimise potential impacts on surface water receptors. Permeable surfaces would be used, e.g. in the main car parking area and there would be a number of swales and detention ponds. Water falling onto impermeable surfaces (e.g. access roads or the Traffic Incident Management Area (TIMA)) would be channelled into the SuDS infrastructure.

9.11.14. Silt traps and hydrocarbon interceptors would be required for some areas of the site drainage system to prevent the supply of sediment and other contaminants to the surface drainage network during operation (e.g. for the TIMA).

9.11.15. Foul sewage from the operational facility would be collected and discharged to ground. Effluent would either pass through a septic tank or a package treatment works prior to its discharge.

iii) Removal and reinstatement

9.11.16. Once the need for the facility has ceased, the buildings and associated infrastructure would be removed which would maximise the potential for re-use. When the site has been cleared, the area would be returned to its current existing use (i.e. agriculture).

9.11.17. Controls to be adopted during the restoration of the site would be as described for the construction phase.

c) Preliminary assessment of effects

i) Construction

9.11.18. The shallow perimeter bund would contain surface water run-off within the site before it infiltrates to ground. The site would be isolated from the wider environment, including both the River Deben and River Ore and as a result the construction phase of the development would not likely have any significant effects.

ii) Operation

9.11.19. There would be no significant effects during operation. The proposed drainage system would contain surface water run-off within the site before infiltrating it to ground, whilst silt traps and hydrocarbon interceptors would intercept pollutants.

iii) Removal and reinstatement

9.11.20. Considering both the baseline conditions of the site and the environmental design and embedded mitigation, there would be no significant effects at the site.

d) Additional mitigation and monitoring

9.11.21. Once operational, periodic inspection and maintenance of the SuDS infrastructure may be required to ensure the continued efficacy of the surface water drainage system.

e) Preliminary assessment of residual effects

9.11.22. No significant adverse residual effects are expected during the construction, operation or removal and reinstatement phases.

f) Completing the assessment

9.11.23. Once the proposals for the development are finalised, a full assessment of the potential effects on the surface water environment will be completed as part of the Environmental Impact Assessment (EIA) and the results presented in an ES The ES will present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 9.11.1 Summary of effects for the construction phase

Surface Water

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
River Deben	Contamination of the river.	Isolation of the site from the wider environment to prevent off-site effects. CEMP measures including pollution prevention measures (e.g. wheel washing and separation of working areas from surface waters.	Not significant	Not required	Not significant
River Ore			Not significant		Not significant
Existing ponds within the site.	Pollution of controlled waters.	Silt traps and hydrocarbon interceptors will be incorporated into the design. CEMP measures including pollution prevention measures (e.g. wheel washing and separation of working areas from surface waters.	Not significant		Not significant

Table 9.11.2 Summary of effects for the operational phase

Surface Water

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
River Deben	Contamination of the river.	Swales, silt traps and hydrocarbon interceptors will be incorporated into the design.	Not significant	Active management and maintenance of the drainage system to maximise its efficacy.	Not significant
River Ore			Not significant		Not significant
Existing ponds within the site.	Pollution of controlled waters.	Silt traps and hydrocarbon interceptors will be incorporated into the design.	Not significant		Not significant

Table 9.11.3 Summary of effects for the removal and reinstatement phase

Surface Water

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
River Deben	Contamination of the river.	Isolation of the site from the wider environment to prevent off-site effects. CEMP measures including pollution prevention measures (e.g. wheel washing and separation of working areas from surface waters.	Not significant	Not required	Not significant
River Ore			Not significant		Not significant
Existing ponds within the site.	Pollution of controlled waters.	CEMP measures including pollution prevention measures (e.g. wheel washing and separation of working areas from surface waters.	Not significant		Not significant

9.12. Flood risk

9.12.1. The figures for flood risk are presented in **Volume 3** as **Figures 9.12.1** and **9.12.2**.

a) Baseline environment

9.12.2. LiDAR data show the site to be relatively flat. The highest ground levels are located in the north-west corner of the site, slightly above 29m ODN. Ground levels lower to around 25m above ODN in the south-west of the site, adjacent to the A12. The site is currently greenfield, permeable agricultural land.

9.12.3. The site is on the watershed of two river catchments, however, it is located entirely within Flood Zone 1 and the risk from river flooding is 'low' (**Figure 9.12.1**). The River Deben is located approximately 800m south-west of the proposed development at its closest point. The River Ore is located approximately 475m north-east of the proposed development at its closest point. The site does not appear to drain directly into either of these water bodies, both of which are classed as by the Environment Agency as 'Main Rivers'.

9.12.4. The Environment Agency's 'flood risk from surface water' map identifies the majority of the site to be at 'very low' surface water flood risk, with several localised areas having a 'low' to 'high' risk (**Figure 9.12.2**). Areas showing as having a 'high' risk include a historic pond feature, a topographical low spot in a field and a thin strip of land just north of the B1078.

9.12.5. There is a stretch of the A12 also identified as having a 'high' risk of surface water flooding as it passes under the B1078.

9.12.6. There is a reservoir approximately 300m south-east of the site. The Environment Agency's 'flood risk from reservoirs' map confirms the site would not be affected if this reservoir were to breach.

9.12.7. **Table 9.12.1** summarises the flood risk to the site from the sea, groundwater, sewers and reservoirs, which are assessed as low.

b) Environmental design and embedded mitigation

9.12.8. The Sequential Test aims to steer new development away from areas of higher flood risk. The positioning of the site in Flood Zone 1 complies with this requirement. There would be no loss of functional floodplain.

i) Construction

9.12.9. The majority of the site would be isolated from adjacent land parcels by the construction of shallow perimeter bunds at an early stage of construction, ensuring surface water run-off would be contained within the site and then infiltrated to ground. A perimeter ditch would be constructed immediately outside of the proposed bunds to capture any off-site run-off that would otherwise have flowed onto the site.

9.12.10. Monitoring and maintenance of the drainage system would be carried out to preserve its integrity and maintain its design capacity.

ii) Operation

9.12.11. It is likely that infiltration to ground would be viable at this site. SuDS would be implemented to provide a natural approach to managing drainage. The main car parks would have permeable surfaces and there would be a number of swales and detention ponds.

9.12.12. Surface water from impermeable surfaces (e.g. access roads) would be channelled into and attenuated

Table 9.12.1 Summary of flood risk at the southern park and ride site

Source of flooding	Flood risk
Fluvial	Low: less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
Tidal/coastal	Low: Site beyond the coastal extent. Less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
Surface water (pluvial)	Very Low: less than 1 in 1,000 annual probability of surface water flooding in any year (<0.1%).
Groundwater	Low: soil is permeable (pending further investigation) and the site is located on higher ground levels than some surrounding areas.
Sewers	Low: greenfield site and surrounding arable land and sewers have not currently been identified on the site.
Reservoirs and other artificial sources.	Not at risk of flooding from reservoirs or other artificial sources.

within the SuDS infrastructure. Run-off from buildings would be disposed to soakaways.

9.12.13. Climate change will be considered in the detailed drainage design, in particular future changes in rainfall intensity. The drainage design will consider exceedance flows to limit water depths in parking areas. This would be achieved by using the site topography to direct excess surface water flows to less critical areas of the site from where water would infiltrate to ground.

9.12.14. Monitoring and maintenance of the drainage system would be carried out to preserve its integrity and maintain its design capacity.

c) Preliminary assessment of effects

9.12.15. The use of perimeter bunds and ditches, installed early in the construction phase means there would be minor additional flood risk during the construction phase until connection with the operational phase drainage system.

9.12.16. During operation, the proposed drainage system would attenuate surface water run-off, resulting in no additional flood risk. A small section of the proposed carriageway and footway at the site entrance is currently at high risk from surface-water flooding. This will be incorporated into the detailed drainage design and it is likely there would be a minor beneficial impact on surface water flood risk in that area.

d) Additional mitigation and monitoring

9.12.17. No additional measures are required.

e) Preliminary assessment of residual effects

9.12.18. The effects would be unchanged from those presented above.

f) Completing the assessment

9.12.19. A full flood risk assessment for this site will be submitted as part of the application for development consent.

Table 9.12.2 Summary of effects for the construction phase

Flood risk

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Surface Water	Increase in impermeable area and associated surface water run-off during construction of site.	Bunds and ditches constructed to contain surface water run-off on-site and to intercept off-site surface water flows.	Minor	None required	Negligible
	Off-site surface water flow crossing the site.	Bunds and ditches constructed to contain surface water run-off on-site and to intercept off-site surface water flows.	Minor	None required	Negligible

Table 9.12.3 Summary of effects for the operational phase

Flood risk

Topic/receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Surface Water	Increase in impermeable area and associated surface water run-off from the site.	Use of infiltration SuDS, including an allowance for climate change; improved management of existing areas flood risk.	Minor Beneficial	None required	Negligible

9.13. Traffic and transport

a) Baseline environment

i) Highway network

9.13.1. The site is located alongside the northbound slip road onto the A12 from the B1078/B1116 junction. The slip road is a two-way single carriageway road and the final section closest to the A12 is northbound-only.

9.13.2. Around Wickham Market several roads are relevant to the southern park and ride site including:

- The A12 dual carriageway running east of the site and intersecting with the B1078 by means of a grade-separated junction. The park and ride site would be accessed from the A12's northbound on-slip.
- The B1078, which follows an east-west alignment to the north of Wickham Market and passes through the eastern end of the village.
- The B1116, which runs north towards Hacheston from the B1078.
- Easton Road, which follows an east-west alignment north of Wickham Market.

9.13.3. The existing daily traffic volumes carried by the A12, the B1078 and the B1116 are 24,550, 3,650 and 6,650 vehicles per day (**Volume 1**, **Chapter 7**, **Table 7.2**) respectively, which are all well within the traffic-carrying capacity of these roads. Easton Road carries low traffic volumes.

9.13.4. There is on-street parking on the B1078 between Border Cot Lane and where the B1078 crosses the River Deben. This restricts the B1078 to a single lane width in some places when vehicles are parked and causes some delay during the busiest periods.

9.13.5. None of the junctions in the area exhibit any consistent level of congestion, including the B1078/B1116 roundabout, which is operating well within capacity.

9.13.6. A total of four accidents were recorded along the stretch of the A12 closest to the park and ride site between 2013 and 2017[16]. One was a serious accident that occurred on the A12 beneath the B1078 overbridge. Two slight accidents occurred just north of the B1078 slip roads and another slight accident was close to the southbound exit slip road.

9.13.7. The accident record of local roads, which handle lower traffic volumes than the A12, is generally low. One slight severity accident was recorded in the past five years at the B1078/B1116 roundabout, one on the B1078 overbridge and two slight accidents to the north and west on or around Easton Road. One serious accident occurred on the B1078 east of the A12.

9.13.8. Overall, the accident rate around the proposed park and ride is generally low and consistent with the volume of traffic carried by these roads.

ii) Public rights of way network

9.13.9. There are several PRoWs in the vicinity of the site, details of which are provided in **section 9.4**, **Amenity and recreation**.

b) Environmental design and embedded mitigation

i) Construction

9.13.10. The proposed southern park and ride site is located alongside the existing A12 slip road and would be constructed at the beginning of the overall Sizewell C construction programme, during the early years construction phase.

9.13.11. The proposed access includes a deceleration lane to minimise the effect of slower construction traffic on vehicles wishing to join the A12. The access would be built at the start of the construction phase. EDF Energy expects that the slip road would remain open to traffic during this period, though there may be some periods of short-term traffic management to enable safe construction practices.

ii) Operation

9.13.12. The southern park and ride site would be used by construction workers travelling to and from the Sizewell C main development site and is anticipated to be operational for up to ten years.

9.13.13. The park and ride site would be used by Sizewell C construction workers travelling predominantly from the south and west. These workers would drive to and from the southern park and ride site, with buses shuttling them to and from the main development site.

9.13.14. The southern park and ride site is designed to capture drivers approaching not only from the south along the A12 but also from the B1078 and B1116. Therefore, it is likely that a large number of these workers would be travelling along the same routes which they would otherwise have used if driving directly between their homes and the main development site.

[16]The most recent five years for which data was available at the time of writing

9.13.15. By siting the park and ride facility at a strategic location, negative traffic and transport impacts immediately to the north along the A12 are mitigated by removing large volumes of traffic which would otherwise travel along this section of road.

9.13.16. The design of the site access also minimises the effect of vehicles slowing to enter the park and ride site once it is operational, in addition to providing the aforementioned benefits during construction. Road markings on the A12 would be changed accordingly, and it is proposed EDF Energy would request Suffolk County Council to reduce the speed limit on the B1078 over the A12. These proposals are designed to reduce the potential for additional accidents as vehicles join the northbound A12 and traffic joining the B1078 at the A12 southbound exit slip road junction.

9.13.17. In both the rail-led and road-led strategies, a temporary freight holding area is proposed at the northern end of the park and ride site. This would be used only by HGVs which have already passed Ipswich on their journey to the main development site during instances of disruption to the highway network when HGVs are unable to proceed along the designated freight route to Sizewell.

9.13.18. During these times of disruption along the designated freight route, HGVs which are already travelling north of Ipswich would be held at the southern park and ride site until the disruption has cleared, in order to avoid causing further congestion along single carriageway roads further north.

9.13.19. In the road-led strategy only, EDF Energy proposes a freight management facility (FMF) close to the A12/A14 Seven Hills junction (see **Volume 1**, **Chapters 15** and **16**). Provision of a dedicated FMF strategically located at the A12/ A14 junction (see **Volume 1**, **Chapter 15**) would therefore act as mitigation against negative traffic and transport effects at the southern park and ride site, which would handle fewer and less frequent HGVs due to the FMF's existence.

9.13.20. Siting the southern park and ride close to the A12/B1078 junction would give rise to an increase in traffic using the B1078, which in turn could lead to negative traffic effects in and around Wickham Market. This increase is forecast to increase delays on the B1078 between Border Cot Lane and where it crosses the River Deben and would result in a potentially significant effect on the local road network.

9.13.21. Furthermore, an increase in traffic along the B1078 could exacerbate existing delays arising from the presence of on-street parking which necessitates shuttle working along a stretch of road whose effective width is reduced to a single lane.

9.13.22. For this reason, EDF Energy has two potential mitigation proposals: to either divert Sizewell C traffic north of Wickham Market via Valley Road, Easton Road and the B1116, or to temporarily relocate the on-street parking to an off-site location nearby.

9.13.23. The option of upgrading the diversion route would see Sizewell C traffic signed via this route to reduce the B1078 impacts. Changes to Valley Road and Easton Road are proposed in order to mitigate the use of these roads as a diversion route; further details are provided in **Volume 2B**, **Chapter 9**. The alternative parking relocation proposal would make the B1078 two-way throughout its length between Border Cot Lane and the River Deben crossing, thus removing any single lane sections that would cause delay.

c) Preliminary assessment of effects

i) Construction

9.13.24. The effects of construction of the southern park and ride site on the road network are anticipated to be modest. During the peak period of its construction, up to 21 HGVs and up to 100 construction workers are expected to serve the southern park and ride site.

9.13.25. Construction worker trips to the site are likely to occur outside the morning and evening peak hours. In the unlikely event that construction worker trips do coincide with the peak highway hour, the volume of trips associated with building the park and ride would be small in relation to existing traffic volumes and the park and ride construction period is estimated to be 12 months.

9.13.26. It is important to note that the traffic modelling analysis includes allowances for all the Sizewell C construction activity taking place during the Early Years, i.e. at the main development site itself and all the other associated development schemes being built at that time, such as the A12 two village bypass. The increases reported below are not just from construction of the park and ride site itself.

9.13.27. Considering all the construction activity during the Early Years construction period, the modelling work (**Volume 1**, **Chapter 7**, **Table 7.13**) shows an extra 50 vehicles per day on the B1116. This is less than a 1% change and would not be significant.

9.13.28. The increase on the B1078 during construction would be 200 vehicles, i.e. about a 4% increase on flows than would otherwise be expected by 2022. The day to day variation of traffic flows is ±5% so this increase may not be perceptible save for the higher number of HGVs on the A12 Wickham Market bypass. Here, flows during the Early Years construction phase are forecast to rise by about 1,800 vehicles per day, which is about 5-7%. This is slightly more than the day to day variation of ±5%, but the total traffic volume would remain well within the capacity of the A12.

9.13.29. Overall the traffic impacts of the construction of the southern park and ride side are not expected to be significant.

ii) Operation

9.13.30. The southern park and ride site would be operational during the peak construction phase (**Volume 1**, **Chapter 7**, **Table 7.2**) of the Sizewell C project. During this phase, B1078 flows are forecast to increase by 1100 vehicles per day, which is 21%-24% higher than the flows that would otherwise be expected without the Sizewell C project.

9.13.31. However, given the proposed upgrades to Easton Road and other roads to the north of Wickham Market (see above and **Volume 1**, **Chapter 17**, **Highway improvements, cycling and rights of way**), the overall effect is likely to be an improvement in traffic flows compared to the existing situation within Wickham Market insofar as the alternative route – via the upgraded Easton Road – can be used by existing through traffic as well as new traffic travelling to and from the southern park and ride. The alternative option of removing on-street parking along a section of the B1078 would also mitigate the increased flows. There would therefore not be a significant impact on traffic through the centre of Wickham Market.

9.13.32. Forecast daily increases on the B1116 during the peak Sizewell C construction period would be an additional 200 vehicles in the rail-led strategy and 250 vehicles in the road-led strategy. Both would represent a 3% increase on future flows in 2027 and within the ±5% daily variation and so the effect would not be significant.

9.13.33. Daily traffic flows on the Wickham Market bypass would increase by between 2,850 and 3,100 vehicles in the rail-led and road-led strategies respectively. This would be a 9%-11% increase because of the peak Sizewell C construction period activity and increases the total daily traffic volume to around 30,000 vehicles in 2027, though this is well within the capacity of a dual carriageway and so the effect would not be significant.

iii) Removal and reinstatement

9.13.34. Once the construction of Sizewell C is complete, the southern park and ride site would be removed and the site would be returned to its original topography and land use. This phase would generate vehicle movements that would be comparable in nature and duration to those of the construction phase. These vehicle movements would not have a significant impact on traffic.

d) Additional mitigation and monitoring

i) Construction

9.13.35. During construction of the southern park and ride site, temporary signage would be installed on the approaches to the site entrance, advising road users that construction vehicles would be present.

ii) Operation

9.13.36. Construction workers would be directed to use the diversion route north of Wickham Market, if that option is taken forward.

e) Preliminary assessment of residual effects

i) Construction

9.13.37. The residual effects during construction are anticipated to be the same as those set out under preliminary effects described above.

ii) Operation

9.13.38. In the event of the upgrades to Easton Road and other roads north of Wickham Market being selected (See **Volume 1**, **Chapter 17**, **Highway improvements, cycling and rights of way**), as opposed to the temporary removal of on-street parking along a section of the B1078), the residual effects during operation would be beneficial as the road improvements would be retained.

f) Completing the assessment

9.13.39. The work which will be undertaken to complete the assessment is as follows:

- determine whether the rail-led or road-led strategy would be taken forward;
- finalise the VISUM[17] strategic modelling;
- on the basis of the VISUM traffic flows and final design layout, revisit the detailed junction modelling; and
- report findings in Transport Assessment and ES.

[17]VISUM is a widely used transport modelling platform developed by PTV VISION

9.14. Comparison between rail-led and road-led strategies

9.14.1. As the design of the southern park and ride facility is identical under both the road-led and rail-led strategies, the assessments presented in the chapter in relation to landscape and visual, terrestrial ecology, amenity and recreation, terrestrial historic environment, soils and agriculture, geology and land quality, groundwater, surface water and flood risk are equally valid under both strategies and there would be no differences in the significance of effects between the two.

9.14.2. The traffic and transport assessment presented in the chapter is equally valid under both strategies although the rail-led strategy would add approximately 2850 vehicles per day to the number of vehicles on the Wickham Market bypass at this location whilst the road-led strategy would add approximately 3100. The additional vehicle numbers on the B1116 would be 200 under the rail-led strategy and 250 under the road-led strategy. However, there would be no differences in the significance of traffic, noise or air quality or vibration effects between the two strategies at this location given the relatively small difference in vehicle movements between the two strategies.

10. Freight Management Facility PEI

10.1. Introduction to PEI for the freight management facility options

10.1.1. Volume 1, Chapter 15 sets out EDF Energy's proposals for a freight management strategy, which would support the road-led strategy. The freight management facility (refer to **Volume 1, Figure 2.15**) would accommodate up to approximately 150 parking spaces for Heavy Goods Vehicles (HGVs). It would assist in allowing a controlled pattern of deliveries to site with reduced movements during peak or sensitive hours on the network. It could provide facilities where paperwork and goods can be checked prior to delivery to the main construction site, and a location where HGVs are held while they wait to enter the site or in the event of an accident on the local road network which prevented access to the site. It would not be required under a rail-led strategy.

10.1.2. When the chosen site is no longer required it is assumed within the PEI that it would be returned to its existing agricultural use. Two alternative sites, described below, are being considered in this Stage 3 consultation, as follows:

- **Option 1:** A12/A14 Seven Hills site
  This option is approximately 9.9 hectares (ha) in area and is located to the south-west of the A12/A14/A1156 Seven Hills junction near Ipswich. The site is accessed off the Old Felixstowe Road and is bounded by the A1156 to the west, Old Felixstowe Road to the south and the A14 westbound off-slip to the north-east.
- **Option 2:** Innocence Farm site
  This option forms part of a larger (115ha) site which is located adjacent to the communities of Kirton and Trimley St Martin at Innocence Farm and immediately north of the A14. There is an existing road (Croft Lane) leading north from the A14. The site would be accessed via a new junction on the eastern side of Croft Lane to the north of the A14.

10.1.3. Whichever location is chosen, the proposals are likely to have some effects on the environment during construction, operation and the removal and restoration phase. The principal, likely, significant, adverse and beneficial effects are explained below.

10.1.4. This chapter presents each of the topics relevant to the site in turn, under the following sub-headings: (a) Baseline environment, (b) Environmental design and embedded mitigation, (c) Preliminary assessment of effects, (d) Additional mitigation and monitoring, (e) Preliminary assessment of residual effects and (f) Completing the assessment. The assessments are applicable to both locations unless otherwise stated. In particular, for many topics, the embedded measures, the assessment of effects and the additional mitigation measures are common to both locations. The two locations are identified as Option 1 and Option 2 as defined above.

10.1.5. At the end of the chapter a short comparison is presented between the two options, drawing on the PEI presented in the main body of the chapter.

[Footnotes here]

10.2. Landscape and visual

10.2.1. The figure for landscape and visual is presented in **Volume 3** as **Figure 10.2.1**.

a) Baseline environment

i) Option 1

10.2.2. The site for Option 1 is located south-east of Ipswich on the southern edge of the A14. It is also adjacent to Felixstowe Road and the Ipswich to Felixstowe railway branch line to the south-west. The site is currently arable farmland, with an attenuation pond in the northern corner. The majority of the surrounding area is arable farmland with well-defined hedgerow field boundaries, interspersed with large areas of woodland and smaller copses. Road and rail infrastructure is prevalent in the vicinity of the site.

10.2.3. The site is surrounded by intermittent hedgerows with occasional mature hedgerow trees. A further hedgerow runs north-east to south-west across the centre of the site, dividing it in two.

10.2.4. At a national level, the site and the majority of the surrounding area are situated within National Character Area 82 (NCA82): Suffolk Coast and Heaths (Ref. 10.2.1). NCA82 comprises low-lying gently undulating farmland with areas of woodland, heath and forest plantation. The area surrounding the site is typical of this.

10.2.5. At a local level, the site is located in the 'estate sandlands' landscape character type as identified in the Suffolk County Landscape Character Assessment (Ref. 10.2.2) and shown on **Figure 10.2.1**. This is a flat or very gently rolling landscape of sandy soils covering the Brecks and parts of the Suffolk coast, which forms a slightly elevated area of land on which the site sits. The key characteristics are described in the Suffolk County Landscape Character Assessment as:

- *"Flat or very gently rolling plateaux of free-draining sandy soils, overlying drift deposits of either glacial or fluvial origin;*
- *Chalky in parts of the Brecks, but uniformly acid and sandy in the south-east;*
- *Absence of watercourses;*
- *Extensive areas of heathland or acid grassland;*
- *Strongly geometric structure of fields enclosed in the 18th & 19th century;*
- *Large continuous blocks of commercial forestry;*
- *Characteristic 'pine lines' especially, but not solely, in the Brecks;*
- *Widespread planting of tree belts and rectilinear plantations;*
- *Generally a landscape without ancient woodland, but there are some isolated and very significant exceptions;*
- *High incidence of relatively late, estate type, brick buildings;*
- *North-west slate roofs with white or yellow bricks. Flint is also widely used as a walling material;* and
- *On the coast red brick with pan-tiled roofs, often black-glazed".*

10.2.6. The locations of different groups of people within the study area who may experience views of the proposed development are shown on **Figure 10.2.1**. The key potential visual receptors within the study area include the following:

- the settlements of Bucklesham, Nacton and Levington;
- transport routes including the A14, the A12, the A1156 and the Ipswich to Felixstowe branch line;
- recreational routes including a bridleway along the south-eastern boundary of the site, a number of further Public Rights of Way (PRoW) to the south-east of the site across Levington Heath, PRoW to the south of the site and east of Levington and a public footpath north of the site and the A14; and
- dispersed farmsteads, with the closest residential properties being Keepers Cottages to the south-east.

10.2.7. Visibility from many of these locations is likely to be limited due to a combination of existing woodland and established hedgerows, as well as the relatively flat landform. In most cases, visibility is likely to be limited to approximately 500 metres (m) to the north, east and south-east of the site where landform and existing vegetation begin to interrupt visibility; 800m to the north-west at the elevated junction of the A12 and A14, and more open stretches of the A1156; and approximately 50m to the south-west where there is woodland along the existing railway line.

10.2.8. The Suffolk Coasts and Heaths Area of Outstanding Natural Beauty (AONB) is located approximately 670m to the south-west of the site at its closest point.

10.2.9. A locally designated landscape referred to as a Special Landscape Area (SLA), covers the valleys of Mill River

[Footnotes here]

and Kirton Brook, and their tributaries, to the north-east of the site. It is approximately 1.2 kilometres (km) from the site at its closest point.

ii) Option 2

10.2.10. The site for Option 2 is located south-east of Ipswich on the northern edge of the A14. The site is currently arable farmland. The majority of the surrounding area is arable farmland, with well-defined hedgerow field boundaries, interspersed with areas of woodland and smaller copses. Road and rail infrastructure is prevalent in the vicinity of the site.

10.2.11. The site forms part of a large agricultural field with an intermittent hedgerow along the north-western boundary, a woodland block around a residential property (Croft Lodge) on part of the northern boundary and semi-mature vegetation along the A14 forming the south-western boundary of the site. The north-eastern boundary of the site is largely open, as is the western corner of the site. Existing woodland is located to the south-east of the site, beyond the site boundary but forming the edge of the field within which the site is located.

10.2.12. As for Option 1, at a national level, the site and the majority of the surrounding area are situated within NCA82: Suffolk Coast and Heaths. NCA82 comprises low-lying gently undulating farmland with areas of woodland, heath and forest plantation. The area surrounding the site is typical of this.

10.2.13. At a local level, the site is located in the 'plateau estate farmlands' landscape character type and is immediately adjacent to the 'estate sandlands' landscape character type in which Option 1 is located as identified in the Suffolk County Landscape Character Assessment and shown on **Figure 10.2.1**. The 'plateau estate farmlands' is a largely arable landscape with scattered woodland cover, which often feels open. The key characteristics are described in the Suffolk County Landscape Character Assessment as:

- *"Flat landscape of light loams and sandy soils;*
- *Large scale rectilinear field pattern;*
- *Network of tree belts and coverts;*
- *Large areas of enclosed former heathland;*
- *18th-19th & 20th century landscape parks;*
- *Clustered villages with a scattering of farmsteads around them;*
- *Former airfields;* and
- *Vernacular architecture is often 19th century estate type of brick and tile".*

10.2.14. The locations of different groups of people within the study area who may experience views of the proposed development are shown on **Figure 10.2.1**. The key visual receptors within the study area include the following:

- the settlements of Levington, Kirton and Trimley St Martin;
- transport routes including the A14 and the Ipswich to Felixstowe branch line;
- recreational routes including a Sustrans National Cycle Route along the southern edge of the A14, a public footpath west of the site on the opposite side of the A14 and a group of public footpaths north-east of the site and west of Kirton; and
- dispersed farmsteads, with the closest residential properties being Croft Lodge on the northern boundary of the site, Innocence Cottage to the north-east and Morston Hall to the south.

10.2.15. Visibility from many of these locations is likely to be limited due to a combination of existing woodland and established hedgerows, as well as the relatively flat plateau landform. In most cases, visibility is likely to be limited to approximately 1km to the north although existing hedgerows and woodland make this visibility intermittent: 1.3km to east and south-east of the site where vegetation and settlement would interrupt views; 650m to the north-west along the A14 before vegetation would interrupt views; and approximately 60m to the south and south-west where there is woodland between the A14 and a parallel local road. There may be intermittent visibility of taller elements of the proposals, such as lighting, further from the site boundary.

10.2.16. The Suffolk Coasts and Heaths AONB is located approximately 400m to the south-west of the site at its closest point.

10.2.17. A locally designated landscape covers the valleys of Mill River and Kirton Brook and their tributaries to the north-east of the site, and is referred to as an SLA. It is approximately 400m from the site at its closest point.

b) Environmental design and embedded mitigation

10.2.18. A number of mitigation measures have been identified and incorporated into the design for both the construction and operation phases of the proposed

[Footnotes here]

development for either option, which will help to manage and reduce potential environmental effects. These could include the following:

- existing boundary vegetation would be retained and new planting, grassed bunding and/or fencing would be provided around site boundaries to provide screening; and
- landscape proposals for the proposed development, whichever option is taken forward, would include grassed areas, tree and shrub planting and these would be maintained for the lifetime of the development before being removed when the agricultural use is reinstated.

c) Preliminary assessment of effects

i) Construction

10.2.19. During construction of either option there would be a localised change to the landscape character of the site and its immediate context. There would also be localised visual effects for users of roads, footpaths and bridleways in close proximity to the site. Given the localised extent of the effects and the very short-term duration of these effects, they are unlikely to be significant.

ii) Operation

10.2.20. During operation of either option, there would be a localised effect on the character of the landscape within the site, arising from the change from arable fields to HGV parking with associated infrastructure. Effects would be significant and adverse but temporary in nature.

10.2.21. Beyond the site boundaries, effects on landscape character would rapidly reduce. For Option 1, existing road infrastructure to the north and south would limit significant effects on landscape character to within the site boundary. To the south-east and north-west within approximately 350m and 250m respectively, effects on landscape character would reduce so that they are not significant as a result of the existing field pattern and extent of vegetation. For Option 2, existing road infrastructure and associated vegetation to the north-west and south-west would limit significant effects on landscape character to within the site boundary. To the north and south-east within approximately 250m and 160m respectively, effects on landscape character would reduce so that they are not significant where existing landscape features would prevent the proposals influencing landscape character to a significant extent.

10.2.22. For Option 1, desk and field study has confirmed that the proposed development would be unlikely to be visible from Levington and Nacton due to the presence of intervening vegetation. From Bucklesham there are unlikely to be more than occasional glimpses of the proposed development due to intervening vegetation. There are unlikely to be any significant visual effects for any settlements. From many of the individual properties and farmsteads in the surrounding area intervening vegetation will also prevent visibility of the proposed development. Effects on residential amenity would be mitigated via planting as appropriate to each case as part of the embedded landscape proposals.

10.2.23. For Option 2, desk and field study has confirmed that there are unlikely to be more than occasional glimpses of the proposed development from Kirton and Trimley St Martin due to intervening vegetation. The proposed development would be unlikely to be visible from Levington. There are unlikely to be any significant visual effects for any settlements. From many of the individual properties and farmsteads in the surrounding area intervening vegetation will also prevent visibility of the proposed development. Effects on residential amenity would be mitigated via planting as appropriate to each case as part of the embedded landscape proposals.

10.2.24. For users of main transport routes in the surrounding area to Option 1, there are likely to be views of the proposed development from the A14 as it passes the site, including from the elevated stretch of the route over the A12/A1156 junction. The proposed development would be likely to be visible from sections of the A1156 between the A14 and Felixstowe Road. However, views would be limited to a relatively short section of the road. Views from the A12 and the Ipswich to Felixstowe branch line would be likely to be very limited due to the presence of intervening vegetation. Given the limited lengths of these routes where views would be possible, there are unlikely to be any significant visual effects for users of any of the surrounding roads.

10.2.25. For users of main transport routes in the surrounding area to Option 2, there would likely be views of the proposed development from the A14 as it passes the site. However, views would also be limited to a relatively short section of the road. Views from the Ipswich to Felixstowe branch line would again likely to very limited due to the presence of intervening vegetation. Given the limited lengths of these routes where views would be possible, there are unlikely to be any significant visual effects for users of any of the surrounding roads.

10.2.26. In relation to Option 1, there would be open, close range views of the proposed development from the bridleway along the south-eastern boundary of the site. There is also likely to be some visibility of the proposed development from the further PRoW to the south-east of the site across Levington Heath. However, the existing vegetation along the boundary of the site would likely reduce this visibility and filter any potential views. From the PRoW to the south of the site and east of Levington, intervening vegetation would be likely to largely screen the proposed development from view. The public footpath to the north of the A14 runs along the northern side of an existing hedgerow that is likely to prevent most views towards the proposed development. There are unlikely to be any significant visual effects for users of these routes.

10.2.27. In relation to Option 2, there will be views towards the proposed development from the Sustrans National Cycle Route on the southern side of the A14. However, these views would be across the A14 dual carriageway and would be filtered by the existing vegetation along the southern boundary of the site. Views from the public footpath west of the site on the opposite side of the A14 would be similar to those from the Sustrans National Cycle Route. From the group of public footpaths north-east of the site and west of Kirton, any views towards the proposed development would be filtered by existing vegetation and are likely to be intermittent. There are unlikely to be any significant visual effects for users of these routes.

iii) Removal and reinstatement

10.2.28. During restoration of the land back to agriculture, the buildings, hard standing, site drainage, perimeter earth bunds and temporary landscaping would be removed, and the landscape and visual impacts experienced would be very similar to those of the construction phase. Given the temporary duration of these effects, they are unlikely to be significant.

d) Additional mitigation and monitoring

10.2.29. The preliminary assessment of effects presented above identifies potential significant effects on the landscape character of both possible sites and the immediate surroundings for either option. The localised effects on landscape character are unlikely to be able to be reduced further by any additional mitigation measures as there will remain a fundamental change in the character of the site and its immediate surroundings.

e) Preliminary assessment of residual effects

10.2.30. During construction there are unlikely to be any significant residual effects on landscape character, designated landscapes or visual effects.

10.2.31. During the operational phase of the proposed development, it is considered that there would be significant residual effects on the character of the landscape within and immediately around the site for both options. There are unlikely to be any significant residual visual effects.

10.2.32. During restoration of the land back to agricultural use there are unlikely to be any significant residual effects on landscape character, designated landscapes or visual effects.

f) Completing the assessment

10.2.33. The Environmental Statement (ES) will present a full Landscape and Visual Impact Assessment (LVIA) for the chosen freight management facility option, underpinning the conclusions drawn above in relation to significant effects, updated where relevant to account for any design changes.

10.2.34. Ahead of this, a study area, viewpoints and selected visualisations of the proposals for the selected option would be agreed with the Local Planning Authority and key stakeholders.

Table 10.2.1 Summary of effects for construction phase (both options)

Landscape and visual

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Landscape character	Changes to landscape character and landscape features within the site and surrounding landscape.	None required	Not significant	None required	Not significant
Visual receptors	Changes to views for users of roads, footpaths and bridleways in close proximity to the site.	None required	Not significant	None required	Not significant

Table 10.2.2 Summary of effects for operational phase (both options)

Landscape and visual

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Landscape character within the site and its immediate context.	Introduction of new HGV parking with associated infrastructure.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Significant	None	Significant
Landscape character beyond approximately 350m of the site boundary for Option 1 and 250m for Option 2.	Changes to landscape character and key characteristics within the surrounding landscape.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Not significant	None required	Not significant
Visual receptors	Changes to views for local residents and users of roads, footpaths and bridleways in close proximity to the site.	Retention of established vegetation. Introduction of appropriate landscape proposals.	Not significant	None required	Not significant

Table 10.2.3 Summary of effects for removal and reinstatement phase (both options)

Landscape and visual

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Landscape character	Changes to landscape character and landscape features within the site and surrounding landscape.	None required	Not significant	None required	Not significant
Visual receptors	Changes to views for users of roads, footpaths and bridleways in close proximity to the site.	None required	Not significant	None required	Not significant

10.3. Terrestrial ecology and ornithology

10.3.1. The figure for terrestrial ecology and ornithology is presented in **Volume 3** as **Figure 10.3.1**.

a) Baseline environment

10.3.2. This baseline has been compiled following a detailed review of desk study information, including a data request from the Suffolk Biodiversity Information Service (SBIS), a review of aerial photographs and Ordnance Survey (OS) maps, and a site visit carried out in August 2018 during which the locations were viewed from publicly accessible areas.

i) Option 1

10.3.3. There are two European sites comprising Special Protection Areas (SPAs) and Ramsar Sites within 5km of Option 1 (both sites carry both designations). These are: the Stour and Orwell Estuaries SPA and Ramsar located approximately 1.6km south; and the Deben Estuary SPA and Ramsar located approximately 4.9km north-east.

10.3.4. There are seven nationally designated sites (Sites of Special Scientific Interest (SSSI)) within 5km of Option 1, these being: Nacton Meadows SSSI located approximately 900m south-west; Ipswich Heaths SSSI located approximately 3.3km north-west; Bixley Heaths SSSI located approximately 4.2km north-west; Waldringfield Pit SSSI located approximately 4.5km north; Orwell Estuary SSSI located approximately 1.6km south; Newbourn Springs SSSI located approximately 4.1km north; and Deben Estuary SSSI located approximately 4.9km north-east.

10.3.5. There are six non-statutory designated County Wildlife Sites (CWS) within 2km of Option 1, all of which are over 500m from the proposed development. These are: Nacton Meadows CWS; Home Wood CWS; Levington Cut CWS; Levington Lagoon CWS; Stratton Hall Wood CWS; and Kirton Reservoir CWS.

10.3.6. The habitat within Option 1 comprises two arable fields bounded by hedgerows with a hedgerow dividing the fields. To the north of the western-most field are two waterbodies (adjacent to the A14) which appear to be balancing ponds surrounded by scrub and/or rough grassland and therefore likely to form part of the A14 estate. However, part of one of these waterbodies is within the site boundary. Hedgerows and ponds are habitats of principal importance (Ref. 10.3.1, section 41). The site is bounded to the north by the A14 and the south by Felixstowe Road and arable fields extend to the west and east.

10.3.7. A number of notable invertebrate species have been recorded in the wider area, mostly from Bucklesham to the north, as well as from areas of woodland in the wider landscape. Given that the habitat at Option 1 is predominantly arable farmland the site is unlikely to be of particular importance to notable invertebrate species.

10.3.8. There are no records of great crested newts[1] (*Triturus cristatus*) from within 500m of Option 1 although the two balancing ponds adjacent to the A14 could support this species. In addition, there are a series of waterbodies to the south of the railway line and Felixstowe Road within and adjacent to Decoy Wood that could support this species. Although these waterbodies are large, reducing their suitability for great crested newts, the species could be present. The A14 would act as a barrier to great crested newts and any ponds to the north of the A14 have not been considered. The hedgerows adjacent to the site provide suitable habitat for the terrestrial phase of this species, including potential hibernation sites, and aid connectivity to the wider landscape.

10.3.9. The desk study revealed a single record of a grass snake (*Natrix natrix)* from within the wider area. The majority of the site consists of suboptimal habitat for reptiles[2], although the scrub and rough grassland to the north of the site and the field margins could provide suitable habitat for a small number of reptiles. Overall, the site is unlikely to be of particular importance to reptiles.

10.3.10. Based on SBIS records, breeding birds typical of agricultural habitats are present, including linnet (*Linaria cannabina*) and yellowhammer (*Emberiza citronella*), as well as ground-nesting birds such as skylark (*Alauda arvensis*). Barn owl[3] (*Tyto alba*) is also present in the wider area.

10.3.11. Common and soprano pipistrelle bats (*Pipistrellus pipistrellus* and *Pipistrellus pygmaeus*) and brown long-eared bat (*Plecotus auritus*)[4] have been recorded in the wider area, with all records located to the north of the site.

[1]Great crested newts are a European Protected Species (EPS), receiving protection under the Conservation of Habitats and Species Regulations (2017) (Ref. 10.3.2). They are also protected under the Wildlife and Countryside Act 1981 (Ref. 10.3.3) and are a species of principal importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[2]All UK species of reptiles are protected under the Wildlife and Countryside Act 1981, making it an offence to kill or injure these species. They are also species of principal importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[3]All wild birds, their eggs and nests are protected under Section 1 of the Wildlife and Countryside Act 1981. Barn owls are also listed on Schedule 1 of the Wildlife and Countryside Act 1981, which affords them extra protection against disturbance whilst nesting.

[4]All species of bat in the UK are EPSs, receiving protection under the Conservation of Habitats and Species Regulations (2017). They are also protected under the Wildlife and Countryside Act 1981. Several bat species, including soprano pipistrelle and brown long-eared bat are species of principal importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006). Barbastelle bats are also listed in the European Commission (EC) Habitats Directive (1992) (Ref. 10.3.4, Annex II), requiring the establishment of SACs to conserve this species.

Linear features such as hedgerows within the site and the wider area could be of value to foraging and commuting bats. The dividing hedgerow supports a single mature oak (*Quercus* spp) and the other boundary hedgerows also support an occasional mature tree, which could be of value to roosting bats. No statutory designated sites within 10km cite bats as a designated interest feature.

10.3.12. There are no records of otter (*Lutra lutra*) or water vole (*Arvicola amphibious*) from within or adjacent to the site, and there are no habitats suitable for these species.

10.3.13. There is a single record of a badger[5] (*Meles meles*) from Nacton to the south-west of the site but overall the site is considered suboptimal habitat for badgers.

ii) Option 2

10.3.14. There are two European sites comprising SPAs and Ramsar sites within 5km of the Option 2 (both sites carry both designations). These are: the Stour and Orwell Estuaries SPA and Ramsar located approximately 1km south; and the Deben Estuary SPA and Ramsar located approximately 4.5km north-east.

10.3.15. There are four nationally designated SSSI sites within 5km of the Innocence Farm site, these being: Nacton Meadows SSSI located approximately 2.5km west; Orwell Estuary SSSI located approximately 1km south; Newbourn Springs SSSI located approximately 4.2km north; and Deben Estuary SSSI located approximately 5km north-east.

10.3.16. There are three non-statutory designated CWS within 2km of the Innocence Farm site: Morston Hall Wood CWS located approximately 490m south, and Kirton Reservoir CWS and Paul's Rough Ground CWS both over 1km north.

10.3.17. Option 2 comprises part of a large arable field bounded by hedgerows and trees to the south and west. A block of deciduous woodland is present adjacent to the northern site boundary. Hedgerows and deciduous woodland are habitats of principal importance. To the south of the site is the A14 and Croft Lane is to the west. Arable fields extend to the north and east.

10.3.18. A number of notable invertebrate species have been recorded in the wider area. Given that the habitat within the Innocence Farm site is predominantly arable farmland, the site is unlikely to be of particular importance to notable invertebrate species.

10.3.19. There are no records of great crested newts[1] from within 500m of the Innocence Farm site. In addition, no waterbodies have been identified within the site or within 500m of the site from OS maps and aerial photography. The A14 would act as a barrier to great crested newts, so any ponds on the opposite side of this road from the site have not been considered. Given the lack of ponds within 500m of the site, great crested newts are unlikely to be present.

10.3.20. The desk study did not reveal any records of reptiles from within the wider area. The majority of the site consists of suboptimal habitat for reptiles[2] although the field margins could provide suitable habitat for a small number of reptiles. Overall, the site is unlikely to be of particular importance to reptiles.

10.3.21. Based on SBIS records, breeding birds typical of agricultural habitats are present, including linnet and yellowhammer, as well as ground nesting birds such as skylark. Barn owl[3] is also present in the wider area.

10.3.22. Two records of bats exist from the wider area, one for an injured pipistrelle bat (*Pipistrellus* sp.) to the north-east of the site; and one for a brown long-eared bat[4] roost from Croft Farm approximately 800m north-east of the site. Linear features such as hedgerows within and surrounding the site and in the wider area could be of value to foraging and commuting bats, and there are some mature trees within the hedgerows that border the site that could be of value to roosting bats. No statutory designated sites within 10km cite bats as a designated interest feature.

10.3.23. There are no records of otters or water voles from within or adjacent to the site, and there are no habitats suitable for supporting these species.

b) Environmental design and embedded mitigation

10.3.24. A summary of the measures that have been incorporated into the design of the proposed development and that will protect the existing features of ecological interest are set out below.

i) Construction

- The proposed freight management sites avoid direct land take from designated sites. Loss of hedgerows would be kept to a minimum, with only small sections removed to facilitate access. Mitigation for the loss of hedgerows would be incorporated into the scheme design.
- Access tracks would be located as far as possible to avoid individual mature trees associated with hedgerows.
- The balancing ponds (associated with the A14) adjacent and within the Seven Hills site would be retained.

[5] [Footnote here] Badgers are protected under the Protection of Badgers Act (1992) (Ref. 10.3.5).

- The Construction Environmental Management Plan (CEMP) would define any ecological constraints and specify any measures required during enabling works and construction in relation to the presence of protected species and any required vegetation clearance works. It would specify the need for an Ecological Clerk of Works to undertake and oversee specific tasks.
- Temporary construction lighting would be sensitively designed. A lighting strategy would minimise use of lighting and light-spill into adjacent habitats. This would reduce impacts on nocturnal species such as bats that may use nearby habitats for roosting or foraging.

ii) Operation

- The lighting scheme would minimise lighting and light-spill into adjacent habitats. This would minimise impacts on nocturnal species such as bats that may use nearby habitats for roosting or foraging.
- In the unlikely event that predicted noise levels are likely to significantly adversely affect key habitat features supporting sensitive species (e.g. an important commuting route for bats), then acoustic fencing or similar would be constructed between the site and habitat supporting these species.

iii) Removal and reinstatement

10.3.25. The site would be returned to greenfield land following the operational phase. During restoration, best practice pollution prevention guidelines would be implemented.

c) Preliminary assessment of effects

10.3.26. This section considers both options together, given that the constraints associated with both sites are similar, so as to avoid repetition. Where constraints are specific to a particular location, this is stated below.

10.3.27. Significant effects on designated sites, plants and habitats, invertebrates, reptiles, breeding birds, otters, water voles and badgers are not anticipated and they are not discussed further in this section of the PEI. A detailed impact assessment would be presented for these habitats and species within the ES and further details of the embedded mitigation to offset any significant effects would also be described.

10.3.28. Significant effects on great crested newts and bats are possible at both locations. A preliminary assessment of effects on these species is provided below.

i) Construction

10.3.29. Waterbodies within Option 1 and within 500m of the site boundary, could support breeding great crested newts. The balancing ponds immediately adjacent to the northern boundary of the site would not be lost as a result of the proposals. Suitable adjacent terrestrial habitat, however, may be affected, potentially resulting in injury or mortality of great crested newts and loss of resting places. There is the potential for a significant adverse effect if the ponds and related terrestrial habitats are important for great crested newts.

10.3.30. For both options, noise and lighting could potentially temporarily disturb bats that may roost within mature trees or use the hedgerows within and surrounding the sites for foraging and commuting. In addition, if any trees with features suitable to support roosting bats require removal, then there is the potential for incidental mortality and loss of roost features. This could potentially be a significant adverse effect depending on the nature and status of any bat roost, if these are present.

ii) Operation

10.3.31. No significant operational effects are envisaged for either option.

iii) Removal and reinstatement

10.3.32. No significant effects are predicted for the removal and restoration phase for either option.

d) Additional mitigation and monitoring

10.3.33. The assessment has identified a limited potential for significant effects to occur for either option if great crested newts or bats are present despite the embedded mitigation measures. Additional mitigation measures may therefore be required to minimise impacts so that significant effects are avoided. Furthermore, additional mitigation measures may also be required in relation to habitats and species for which a significant effect is not anticipated, but which are nonetheless legally protected, to ensure compliance with the legislation.

10.3.34. Under the CEMP, pre-construction surveys would be required and these could require measures such as micro-siting of specific elements of the project or licences for protected species. Monitoring of mitigation measures may also be required to ensure its effectiveness. These measures will be presented in the ES, if relevant.

e) Preliminary assessment of residual effects

10.3.35. Significant residual effects are not considered likely.

[Footnotes here]

f) Completing the assessment

10.3.36. To inform the development of appropriate mitigation measures and complete the ES, an extended phase 1 habitat survey would be undertaken for the chosen option. The focus of the survey will be to identify any ecological constraints such as the presence of legally protected species, particularly bats and great crested newts.

10.3.37. Once the surveys have been completed, the detailed ecological assessment for the ES would then be progressed for the chosen option, clarifying whether significant adverse effects are likely. Any embedded mitigation measures which would be required to mitigate these effects would be defined and incorporated.

Table 10.3.1 Summary of effects for construction phase (both options)

Terrestrial ecology and ornithology

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
European and nationally designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Non-statutory designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Habitats of principal importance (hedgerows, deciduous woodland and ponds).	Habitat loss. Potential pollution from surface water run-off and spillages.	Mitigation for habitat loss incorporated into scheme design. Appropriate surface water control and chemical management outlined in the CEMP. Construction Surface Water Management Plan.	Not significant	None required	Not significant
Great crested newts.	Habitat loss and incidental injury and mortality.	Measures for great crested newt mitigation outlined in CEMP.	Potential adverse significant effect.	Potential mitigation measures under Natural England licence.	Not significant
Reptiles	Habitat loss and incidental mortality.	Measures for reptile mitigation outlined in CEMP.	Not significant	None required	Not significant
Breeding birds	Loss of habitat for nesting and foraging.	Measures for nesting birds and vegetation clearance outlined in the CEMP.	Not significant	None required	Not significant
Bat assemblage	Loss of roosting resource (trees).	Retention of majority of tree resource. Early provision of new roost resource (e.g. bat boxes).	Potential adverse significant effect	Potential mitigation measures under Natural England licence.	Not significant
	Noise and lighting disturbance causing fragmentation and displacement of resident bat populations.	Noise and lighting control measures set out in CEMP.	Potential adverse significant effect.	Potential mitigation measures under Natural England licence.	
Badgers	Disturbance or damage to existing setts.	Measures to protect badgers from construction works detailed with CEMP.	Not significant	Potential mitigation measures under Natural England licence.	Not significant

[Footnotes here]

Table 10.3.2 Summary of effects for operational phase (both options)

Terrestrial ecology and ornithology

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
European and nationally designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Non-statutory designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Habitats of principal importance (hedgerows, deciduous woodland and ponds).	Potential pollution from surface water run-off and spillages.	Sustainable Urban Drainage System (SuDS).	Not significant	None required	Not significant
Great crested newts	No significant effect likely.	None required	No significant effect likely.	None required	No significant effect likely.
Reptiles	No significant effect likely.	None required	No significant effect likely.	None required	No significant effect likely.
Breeding birds	No significant effect likely.	None required	No significant effect likely.	None required	No significant effect likely.
Bat assemblage	Impacts from noise and lighting.	Sensitive lighting scheme following best practice. Potential need for acoustic fence or similar between site and habitats supporting sensitive species.	Not significant	None required	Not significant
Badgers	No significant effect likely.	None required	No significant effect likely.	None required	No significant effect likely.

[Footnotes here]

Table 10.3.3 Summary of effects for removal and reinstatement phase (both options)

Terrestrial ecology and ornithology

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
European and nationally designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Non-statutory designated sites.	No direct or indirect impact pathway identified.	None required	Not significant	None required	Not significant
Habitats of principal importance (hedgerows, deciduous woodland and ponds).	Potential pollution from surface water run-off and spillages. Hedgerows replanted.	Best practice pollution prevention measures outlined in the CEMP. Construction Surface Water Management Plan.	Not significant	None required	Not significant
Great crested newts	No significant effect likely.	None required	No significant effect likely.	None required	No significant effect likely.
Reptiles	No significant effect likely.	None required	No significant effect likely.	None required	No significant effect likely.
Breeding birds	No significant effect likely.	None required	No significant effect likely.	None required	No significant effect likely.
Bat assemblage	Noise and lighting disturbance.	None required	Not significant	None required	Not significant
Badgers	Disturbance or damage to existing setts.	Measures to protect badgers detailed in the CEMP.	Not significant	Potential mitigation measures under Natural England licence.	Not significant

[Footnotes here]

10.4. Amenity and recreation

10.4.1. The figure for amenity and recreation is presented in **Volume 3** as **Figure 10.4.1**.

a) Baseline environment

i) Option 1

10.4.2. Amenity and recreation resources comprise a number of PRoW passing through the rural, predominantly arable agricultural landscape, and an area of common land at Levington Common adjacent to the site as shown on **Figure 10.4.1**. The main PRoW routes that are likely to be affected within the 1km study area lie within Levington Common. Users of the following recreational resources are likely to be affected to a greater degree. There are other PRoW within the 1km study area but the proposed development is unlikely to be perceptible from these routes:

- bridleway E-365/021/0 within Levington Common, running parallel with the south-eastern boundary of the site;
- bridleways E-365/004/0, E-365/005/0 and E-365/009/0, and common land at Levington Heath to the south-east of the site; and
- footpath E-169/017/0 north of the site and the A14.

10.4.3. Visibility from many of these locations is likely to be limited due to a combination of existing woodland and established hedgerows, as well as the relatively flat landform. Existing noise is likely to be audible from road traffic on the A14 and Felixstowe Road which run along the north-eastern and south-western site boundaries, and from trains on the Felixstowe to Ipswich railway line to the south-west of the site.

ii) Option 2

10.4.4. Amenity and recreation resources within the 1km study area comprise a number of PRoW passing through the rural, predominantly arable agricultural landscape, and Sustrans National Cycle Route 1 as shown on **Figure 10.4.1**. Users of the following recreational resources are likely to be affected to a greater degree. There are other PRoW within the 1km study area but the proposed development is unlikely to be perceptible from these routes:

- a group of PRoW to the north-east of the site, south-west of Kirton Hall. The closest is footpath E-352/042/0 which lies approximately 0.4km from the site;
- footpath E-527/008/0 running west from the A14 near the western corner of the site, across a minor road, a railway line and fields; and
- Sustrans National Cycle Route 1 which extends along the along the southern edge of the A14 south of the site.

10.4.5. Visibility from many of these locations is likely to be limited due to a combination of existing woodland and established hedgerows, as well as the relatively flat landform. Existing noise is likely to be audible from road traffic on the A14 which runs along the south-western site boundary, and from trains on the Felixstowe to Ipswich railway line to the south-west of the site.

b) Environmental design and mitigation

10.4.6. A number of mitigation measures have been identified and incorporated into the design for both the construction and operation phases of the proposed development for either option, which would help to manage and reduce potential environmental effects. These include the following:

- existing boundary vegetation would be retained and new planting, grassed bunding and/or fencing would be provided around site boundaries to provide screening and noise attenuation if it was required; and
- landscape proposals for the proposed development, whichever option is taken forward, would include tree and shrub planting which would be maintained for the lifetime of the development.

c) Preliminary assessment of effects

i) Construction

Option 1

10.4.7. Users of bridleway E-365/021/0 parallel to the south-eastern boundary of the site would have open, close range views of the proposed development and hear noise of construction activities for a temporary period. Effects are unlikely to be significant.

10.4.8. Users of bridleways E-365/004/0, E-365/009/0 and E-365/005/0 and common land at Levington Heath to the south-east of the site would have more distant views of the proposed development and hear noise of construction activities for a temporary period. Effects are unlikely to be significant.

10.4.9. Footpath E-169/017/0 north of the site and the A14 runs along the northern side of an existing hedgerow that is likely to prevent most views of the proposed development. Noise from construction would be limited and heard in context with foreground traffic on the A14. Effects would be temporary and are unlikely to be significant.

[Footnotes here]

10.4.10. Users of the PRoW, common land and Sustrans National Cycle Route 1 may experience changes to views and noise levels but are unlikely to experience changes to air quality caused by the proposed development.

Option 2

10.4.11. Users of Sustrans National Cycle Route 1 on the southern edge of the A14 south of the site would see and hear the construction works, in context with existing foreground traffic on the A14. Effects would be temporary and are unlikely to be significant.

10.4.12. Users of the eastern end of footpath E-527/008/0 to the west of the site would experience similar views and noise as the Sustrans National Cycle Route. As walkers travel westwards away from the A14 views would rapidly become filtered by vegetation along the A14 and parallel minor road, and noise levels would reduce. Effects would be temporary and are unlikely to be significant.

10.4.13. Views of the proposed development by users of the group of PRoW to the north-east of the site, south-west of Kirton Hall, would be filtered by existing vegetation and are likely to be intermittent. Noise from construction would be limited and heard in context with foreground traffic on the A14. Effects would be temporary and are unlikely to be significant.

10.4.14. Users of the PRoW, common land and Sustrans National Cycle Route 1 may experience changes to views and noise levels but are unlikely to experience changes to air quality caused by the proposed development.

ii) Operation

10.4.15. Noise levels from the freight management facility are likely to be restricted to the footprint of the facility and receptors close to the site boundary. The noise levels associated with the operation of the proposed development are predicted to be lower than those associated with the construction phase of the proposed development.

Option 1

10.4.16. Users of bridleway E-365/021/0 along the south-eastern boundary of the site would have open, close range views of the proposed development and hear noise of operational activities. Effects are unlikely to be significant.

10.4.17. Users of bridleways E-365/004/0, E-365/009/0 and E-365/005/0 and common land at Levington Heath to the south-east of the site would have more distant views of the proposed development and noise from operational activities would reduce with distance from the site. Effects are unlikely to be significant.

10.4.18. Users of footpath E-169/017/0 north of the site and the A14 are unlikely to be significantly affected by the operational phase of the proposed development, due to intervening vegetation filtering views, and any operational noise being heard in the context of noise from existing traffic on the A14. Effects are unlikely to be significant.

Option 2

10.4.19. Users of Sustrans National Cycle Route 1 on the southern edge of the A14 south of the site would have views of the operational activities. Noise from operational activities would be limited and heard in context with foreground traffic on the A14. Effects are unlikely to be significant.

10.4.20. Users of the eastern end of footpath E-527/008/0 to the west of the site would experience similar views and noise as the Sustrans National Cycle Route. As walkers travel westwards away from the A14 views would rapidly become filtered by vegetation along the A14 and parallel minor road. Noise from operational activities would be limited and heard in context with foreground traffic on the A14. Effects are unlikely to be significant.

10.4.21. Views of the proposed development by users of the group of PRoW to the north-east of the site, south-west of Kirton Hall, would be filtered by existing vegetation and are likely to be intermittent. Noise from operational activities would be limited and heard in context with foreground traffic on the A14. Effects are unlikely to be significant.

iii) Removal and reinstatement

10.4.22. During restoration of the land back to agriculture, the buildings, hard standing, site drainage, perimeter earth bunds and temporary landscaping would be removed, and the amenity and recreation impacts experienced would be very similar to those of the construction phase. Effects are unlikely to be significant.

d) Additional mitigation and monitoring

10.4.23. No additional mitigation is proposed.

e) Preliminary assessment of residual effects

10.4.24. No significant residual effects are expected for any phase of the development.

f) Completing the assessment

10.4.25. The ES will present a full amenity and recreation impact assessment underpinning the conclusions drawn above in relation to significant effects, updated where relevant to account for any design changes.

[Footnotes here]

Table 10.4.1 Summary of effects for construction phase (both options)

Amenity and recreation

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Users of foothpaths, bridleway and Sustrans National Cycle Route.	Potential changes to views, air quality and noise.	None required for landscape and visual. Selection of plant and methodology in accordance with good practice for noise. Measures to be set out in CEMP and appropriate to level of risk identified by Institue of Air Quality Management (IAQM) criteria for air quality.	Not significant	None	Not significant

Table 10.4.2 Summary of effects for operational phase and removal and restoration phase (both options)

Amenity and recreation

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Users of foothpaths, bridleway and Sustrans National Cycle Route.	Potential changes to views, air quality and noise.	None required for landscape and visual and noise.	Not significant	None	Not significant

[Footnotes here]

10.5. Terrestrial historic environment

10.5.1. The figure for terrestrial historic environment is presented in **Volume 3** as **Figure 10.5.1.**

a) Baseline environment

10.5.2. An archaeological Desk Based Assessment (DBA) of both options has been undertaken. This DBA considered existing records of archaeological features and investigations as well as historic mapping, aerial photography and documentary sources. Searches of Suffolk Historic Environment Record (HER), Historic England's (HE's) Archives Monuments Information England (AMIE) and the National Heritage List for England were undertaken in August 2018, to ensure that the assessment included the most up to date information.

10.5.3. No designated heritage assets are recorded within either site.

10.5.4. Option 1 is located c. 110m north-west of a series of six scheduled monuments (SM 1011339 – 1011344). These designations comprise eight bowl barrows and a ring ditch, representing part of a prehistoric barrow cemetery. To the south-west, the Grade II listed Decoy Cottage (SM 1183186) is located within a wooded area, 920m south-west of the site boundary. No designated heritage assets are recorded within the study areas for Option 2 site.

10.5.5. Option 1 contains four identified HER records and three AMIE records, and a further 38 HER records and eight AMIE records are located within its 500m study area. The heritage records include further ring-ditches indicative of barrows 310m south of the site boundary (MXS20017), 380m south of the site boundary (MXS20018), 215m south-west of the site boundary (MSF3666), 210m west of the site boundary (MSF20290) and 115m west of the site boundary (MSF3839). The proximity of these ditches to those already scheduled suggests they form part of the same barrow cemetery. Five archaeological events have been recorded within the HER including an evaluation recording an area of prehistoric occupation 300m north of the site boundary (ESF18928).

10.5.6. Three HER records, identified through aerial photography, are located partially within the Option 2 site. These consist of an undated trackway and field system visible as cropmarks (MSF17277), a curvilinear trackway extending down from a roadside settlement, field boundaries of probable prehistoric date (MSF17895) and the south-western extent of a Second World War (WWII) radar facility. There are 19 HER records and three AMIE records within the 500m study area. These comprise heritage assets ranging from early-medieval pottery (MSF17501) to crop marks of ring ditches described in the HER as Bronze Age barrows (MXS20454). Eight archaeological events have been recorded in the HER.

10.5.7. Historic OS and tithe mapping shows a continuity within the field systems recorded in the study areas of each site from the early 19th century to the present day. It is likely that most surviving hedgerows within the sites would be considered important under the Hedgerow Regulations (Ref. 10.5.1, Schedule 1).

i) Prehistoric

10.5.8. Both Option 1 and 2 are situated in an area with clear evidence for prehistoric activity. Six scheduled monuments represent at least eight barrows and cropmarks indicate the likely presence of several more, in addition to field systems and potential settlement.

Option 1

10.5.9. Three of the HER records located within the Option 1 site are associated with ring ditches and features indicative of bowl barrows similar to the scheduled monuments east of the site (Suffolk County Council HER refs MSF3840, MSF3841, MSF3842). The bowl barrows were excavated in 1978. Two of the barrows (MSF3840, MSF3841) were confirmed and produced evidence of human cremation and grave goods. The third, smallest feature was identified on excavation as a natural mound (MSF3842). The fourth record covers the features as a group and refers to a field boundary identified through aerial photography that appears to respect these features (MSF3826). The excavation of a further ring ditch, interpreted as another bowl barrow 115m west of the site boundary (MSF3839), recorded Bronze Age and Iron Age pottery in addition to a cremation 4m east of the ditch. This indicates that, while the majority of the barrow features visible in aerial photography may have been removed by excavation, further evidence of burials and other archaeological remains are likely to survive in the surrounding areas including within the site itself.

10.5.10. Monitoring of works on the laying of a pipeline between Alton Water and Bucklesham (ESF18928), 300m north of the Option 1 site boundary, recorded an area of prehistoric occupation. Finds included prehistoric pottery sherds associated with a large enclosure ditch and other structural remains including postholes, ditches and burnt clay resembling a hearth. An additional ring ditch indicating a barrow, associated with those recorded within the site, has been observed in aerial photography 115m north-west of the site boundary (MSF3839). A group of bowl barrows, designated as heritage assets are located 785m south-east, (scheduled monument ref 1011339), 895m south-east (1011341) and 420m (1011342), 325m (1011343) and 95m

[Footnotes here]

(1011344) to the east of the site boundary respectively. A further three bowl barrows with an associated ring ditch are covered by a single designation as a heritage asset 670m south-east of the site boundary (SM ref 1011340). Further ring ditches indicating barrows are recorded as cropmarks 310m south of the site boundary (MXS20017), 380m south of the site boundary (MXS20018), 215m south-west of the site boundary (MSF3666); 210m west of the site boundary (MSF20290) and 115m west of the site boundary (MSF3839).

10.5.11. There is a high potential for further remains of a coherent prehistoric settlement and funerary landscape within the site. These remains could have high significance for evidential and historic value. There has been some prior disturbance and any assessment of significance would depend on the nature, preservation and extent of such features. Further archaeological investigation would enable this potential to be clarified.

Option 2

10.5.12. Cropmarks of a curvilinear trackway, associated field boundaries and roadside settlement of likely later prehistoric (Iron Age) date (MSF17895) extending into the Option 2 site are visible on aerial photographs.

10.5.13. A series of cropmarks observed in aerial photography 80m north of the site boundary, have been interpreted as potentially representing the remains of a Neolithic Cursus monument (MXS22451). Ring ditches indicating Bronze Age barrows have also been recorded within this area (MXS22459, MXS20454). A 1995 archaeological assessment of A14 improvement works from Seven Hills to Trimley concluded a high potential for prehistoric remains in the area (ESF18885). Subsequent excavation of a known 25m diameter ring ditch 400m north-west of the site boundary (ESF21181) confirmed ditch depth (1.5m) and width (3.5m). A radiocarbon date, indicative of Late Bronze Age/Early Iron Age construction, was recovered but its reliability is in question owing to uncertain provenance.

10.5.14. There is a high potential for prehistoric remains of medium significance within the Option 2 site. Remains of a similar nature to those surrounding the Option 1 site have been recorded around Option 2 site, and one of these, while tentatively dated, appears to extend into the Option 2 site boundary.

ii) Romano-British

10.5.15. Desk based research indicates the sites were located some distance from the Roman road network and on the periphery of major settlement areas, possibly within an agricultural landscape of field systems and farmsteads.

Option 1

10.5.16. Within the study area, two chance finds dating to the Roman period are recorded, in the form of a denarius of Vespasian and bronze enamelled plate (MSF12155). Field systems, trackways and enclosures observed in aerial photography 315m south-east of the site boundary (MSF3659), 120m south of the site boundary (MSF3829) and 250m north of the site boundary (MSF3771) have been interpreted as of prehistoric Roman period date.

10.5.17. The absence of any firmly dated material of this period within the study area suggests that the potential for archaeological remains dating to the Roman period within the site boundary is limited. The site's location away from the Roman road network suggests that more substantial remains of this date are unlikely. The conjectural dates assigned to cropmarks indicate a low potential for remains of Romano-British agricultural activity, which would be of low significance.

Option 2

10.5.18. The curvilinear trackway observed in cropmarks extending into the site outlined above (MSF17895) has been tentatively dated to the Iron Age/Romano-British period. A chance find of a 3rd to 4th century coin is recorded within the study area (MSF17502), in addition to cropmarks indicating a rectilinear field system, interpreted as of Roman date (MXS22443). These records suggest a medium potential for Roman period remains of low significance to survive within this site.

iii) Early-medieval and medieval

10.5.19. Both sites were located away from settlements in cultivated land. The medieval agricultural economy of this part of Suffolk would have been based on mixed farming and woodland pasture.

Option 1

10.5.20. No finds or features dating to the early-medieval or medieval periods are known within the site boundary.

10.5.21. Within the study area, early-medieval evidence consists of a chance find of a bronze backward-looking beast brooch 345m west of the site boundary (MSF 11224), and Ipswich ware pottery in an excavated ditch 345m south-west of the site boundary (MSF18111). A field system visible as cropmarks 390m north-east of the site boundary has been interpreted as of medieval date (MSF3769), and medieval ditches were also recorded in aerial photographs and archaeological evaluation 345m south-west of the

[Footnotes here]

site boundary (MSF17899). The Domesday Book of 1086, recording pre-conquest landholdings, notes the parish of Levington and indicates the presence of an established settlement. The settlement during the medieval period would have been based on the local parish church, likely on the same site as the present St Peter's Church, 1.6km south of the site boundary.

10.5.22. The site formed part of a rural hinterland away from known centres of settlement during this period. The potential for early-medieval and medieval remains surviving within the site is low.

Option 2

10.5.23. No finds or features dating to the early-medieval or medieval periods are known within the site boundary or the surrounding study area. The principal settlements would have been associated with the respective parish churches of Trimley St Martin, Kirton and Levington, in addition to a settlement identified in Domesday but apparently abandoned since, named *Leofstanestuna*. No medieval finds or features are recorded within the study area. The site was likely within agricultural land at this stage.

10.5.24. As above, the site formed part of a rural hinterland away from known centres of settlement during this period. The potential for early-medieval and medieval remains surviving within the site is low.

iv) Post-medieval and modern periods

10.5.25. No change is evident in either site from the early 19th to the late 20th centuries as indicated in historic OS mapping. Both appear to have been consistently used for arable land following enclosure.

Option 1

10.5.26. Post-medieval remains are recorded by the HER within the study area. Cropmarks indicating field boundaries and trackways were observed 85m south-east of the site boundary (MXS2243), 250m south-east of the site boundary (MSF10737), 270m south-east of the site boundary (MSF3827) and 100m south of the site boundary (MXS20025). A quarry pit is recorded 360m south-east of the site boundary (MXS20021). The Modern period is represented in a set of First World War (WWI) practice trenches 455m south-east of the site boundary (MXS20026) and WWII features in the form of bombing decoys 40m north of the site boundary (MXS22436) and an anti-glider ditch and barbed wire fence 290m south-east of the site boundary (MXS20014).

10.5.27. The land within the site boundary has been shown as cultivated fields as far back as detailed cartographic evidence is available. This correlates with the Historic Land Characterisation, defining the area as post-18th century enclosed land and with the description of later enclosures in the early 19th century from heathland in the area (Scarfe 1987, 198). The major late 20th century changes on the fringes of the site result from the construction of the A14 to the immediate north of the site in the late 1970s.

Option 2

10.5.28. The post-medieval chronology of Option 2 site effectively mirrors that of Option 1 site. This site appears to be shown as agricultural land on historic mapping and borders the road route between Ipswich and Felixstowe and the Felixstowe branch of the Great Eastern Railway. Historic mapping indicates no change to field boundaries or form within the site from the early 19th century as observed in parish tithe and enclosure mapping. Aerial photographs taken in 1944 show a radar station extending into the south-eastern extent of the site (MXS22454). A possible post-medieval field system was recorded 245m south-west of the site boundary (MXS20020).

10.5.29. The potential for post-medieval and modern heritage assets as yet unknown within this site is medium. Such remains would likely be scattered remains of post-medieval agricultural activity or heavily degraded military remains of low significance.

v) Undated

10.5.30. Numerous cropmarks indicating field boundaries, tracks or other features of unknown date are recorded in the study areas around both sites. This includes the field boundary identified in aerial photography within the Option 1 site (MSF3826) and the trackway and field system remains observed in the Option 2 site (MSF17277).

vi) Modern disturbance

10.5.31. Intensive cultivation during the Post-medieval and modern periods is likely to have disturbed the upper layers of any buried archaeology, although more substantial negative features such as ditches and pits are likely to be relatively well-preserved. It is also possible for ploughing and natural processes to result in the development of colluvial deposits, which may preserve earlier features.

b) Environmental design and embedded mitigation

10.5.32. Change to setting arising from visibility of the proposed development could give rise to loss of or harm to

[Footnotes here]

heritage significance at either location. It is anticipated that the location of these sites adjacent to an existing trunk road would preclude any discernible change to setting arising from construction noise, changes to air quality or change to traffic movements. Detailed design would seek to minimise the visual prominence of these features through screening planting and landscaping.

10.5.33. Loss of important hedgerows would adversely affect historic landscape character. Where possible, hedgerows would be retained, with hedgerows that are removed being reinstated on decommissioning of the freight management site.

c) Preliminary assessment of effects

i) Construction

10.5.34. Works including topsoil stripping, site levelling, excavations, subsoil disturbance for road access, and vegetation clearance would take place across the chosen site during the proposed development. Intrusive works of this nature would adversely affect any surviving subsurface archaeological remains, reducing or removing their ability to be further interpreted, resulting in the loss of archaeological interest.

10.5.35. Desk based research has suggested the potential presence of archaeological remains on the sites. Any archaeological remains within the chosen site would be substantially disturbed, if not removed entirely, by the proposed development. This would give rise to a large magnitude of change which could be significant, in the absence of further mitigation.

10.5.36. Hedgerows within the Option 1 site and on the peripheries of the Option 2 site could be considered important under the Hedgerow Regulations 1997. These are best considered as heritage assets of low significance for historic and aesthetic interest resulting from their contribution to historic landscape character. Hedgerows to the edges of the sites would be retained, and it is only hedgerows within the Option 1 site that may be affected. The loss of these hedgerows would give rise to a non-significant effect during the construction period.

10.5.37. Change to setting would arise through visible or audible perception of construction activities. Any changes would be relatively short-term and would not present any lasting change. Change to the significance of designated heritage assets to the south-west (Decoy Cottage, LB1183186) and south-east (six scheduled monuments) of the Option 1 site as a result of change to setting during construction has been considered in line with HE's GPA3 (Ref. 10.5.2). Decoy Cottage's setting is defined by the parkland in which it is situated. Heavy tree cover to the north of this listed building screens views to the north and as such the development at the Option 1 site is not anticipated to have any effect. Designated assets to the south-east of the Option 1 site (the scheduled monuments) are not readily visible and have only a minimal presence in the landscape. Visual change would not give rise to any significant adverse effect. Loss of associated heritage assets resulting from intrusive groundwork within the Option 1 site could reduce the contribution of their setting to archaeological interest of these scheduled monuments through the removal/ degradation of any surviving remains of the barrows located here. While the survival of any such remains is uncertain, any effect is not anticipated to be significant.

10.5.38. No designated heritage assets have been identified which would be affected by change to setting resulting from the construction of the Option 2 site and as such no adverse effects are anticipated.

ii) Operation

10.5.39. Disturbance of any archaeological remains within the chosen site would have occurred, and been effectively mitigated, prior to and during construction. Therefore, no direct effects on heritage assets within the site are anticipated during the operation of the proposed development.

10.5.40. Change to setting of heritage assets would reduce on completion of construction activities and establishment of screening and landscaping, being limited to visibility of structures and vehicle movements within the freight management site. The location of both sites adjacent to the A14 is anticipated to mean that audibility of traffic noise is unlikely to present any perceptual change in setting of heritage assets. Any effects can therefore be expected to be negligible during the operational period.

iii) Removal and reinstatement

10.5.41. Any disturbance of archaeological remains within the chosen site would have occurred and been effectively mitigated during construction. Therefore, no adverse direct effects are anticipated during the removal of the facility or the restoration of the site.

10.5.42. Effects arising from change to setting are anticipated to reduce further during the post-operational period with any restoration of the sites to agricultural use.

d) Additional mitigation and monitoring

10.5.43. Additional mitigation of direct effects on heritage assets would comprise the adoption of an agreed Written

[Footnotes here]

Scheme of archaeological Investigation (WSI) to ensure that the archaeological interest of any significant deposits and features within chosen site could be appropriately investigated, recorded and disseminated. This would ensure that the effect on buried archaeological remains from the proposed development could be adequately mitigated, resulting in a low adverse residual effect, which would be not significant. This mitigation would also serve to mitigate loss of archaeological interest of the scheduled barrows arising from change to setting.

10.5.44. A suitable mitigation strategy and WSI would be agreed with Suffolk County Council Archaeological Service (SCCAS) once all pre-application archaeological fieldwork has been completed and the results are known. Monitoring of the agreed programme of archaeological investigation would be carried out by SCCAS during the implementation of the scheme. Publication and popular dissemination of the results of mitigation works would allow any informative and historic value to be fully realised.

e) Preliminary assessment of residual effects

10.5.45. The loss of archaeological interest through disturbance of archaeological remains within the chosen site could have a significant adverse effect. However, following the implementation of an agreed scheme of archaeological investigation any residual effect is not expected to be significant.

10.5.46. No significant adverse effects arising from change to setting of heritage assets are anticipated.

f) Completing the assessment

10.5.47. 1A full archaeological assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES will present the full assessment underpinning the conclusions drawn in relation to significant direct effects, and would draw upon LVIA, noise, air quality and other assessments where appropriate.

10.5.48. This would include a settings assessment, which would be discussed with HE and, Suffolk Coastal District Council's (SCDC) Conservation Officer. It would consider heritage assets where setting may potentially be subject to effects, their current setting, the potential change, and the magnitude of effect the proposed development may have on their setting. Any mitigation required would also be discussed and would most likely comprise screening and landscaping.

Table 10.5.1 Summary of effects for construction phase (both options)

Terrestrial historic environment

Topic / Receptor	Impacts	Assessment of Effects	Mitigation	Residual Effects
Previously unrecorded archaeological remains.	Disturbance or removal resulting from topsoil stripping and subsoil disturbance.	Significant	Agreed written scheme of archaeological investigation to ensure that the archaeological interest of any significant deposits and features could be appropriately investigated, recorded and disseminated.	Not Significant
Historic hedgerows	Loss due to construction activities.	Not Significant	None	Not Significant
Decoy Cottage (Grade II listed building setting).	Negligible	Not Significant	None	Not Significant
Nearby Scheduled Monuments (setting).	Uncertain, dependent on survival of contemporary archaeological remains within Option 1 site.	Not Significant	None	Not Significant

[Footnotes here]

Table 10.5.2 Summary of effects for operational phase (both options)

Terrestrial historic environment

Topic / Receptor	Impacts	Assessment of Effects	Mitigation	Residual Effects
Decoy Cottage (Grade II listed building setting).	Negligible	Not Significant	None	Not Significant
Nearby Scheduled Monuments (setting).	Negligible	Not Significant	None	Not Significant

Table 10.5.3 Summary of effects for removal and reinstatement phase (both options)

Terrestrial historic environment

Topic / Receptor	Impacts	Assessment of Effects	Mitigation	Residual Effects
Nearby Scheduled Monuments (setting).	Negligible	Not Significant	None	Not Significant

[Footnotes here]

10.6. Soils and agriculture

10.6.1. The figures for soils and agriculture are presented in **Volume 3** as **Figures 10.6.1** to **10.6.3**.

a) Baseline environment

10.6.2. The sites are underlain by an area mapped as the Red Crag Formation, comprising sands, with an overlying drift deposit of sands and gravels (Ref. 10.6.1).

10.6.3. The soils (**Figure 10.6.1**) are described as being freely draining slightly acid loamy soils (Ref. 10.6.2).

10.6.4. Published Agricultural Land Classification (ALC) maps show the sites to comprise Grade 3 agricultural land (Ref. 10.6.3) (**Figure 10.6.2**) totalling approximately 20.39ha. Under the ALC system land is graded between Grade 1 and 5, with Grade 3 subdivided into 3a and 3b. Land in grades 1, 2 and 3a is considered to be 'best and most versatile' land.

10.6.5. There is no detailed ALC mapping available for these sites although land immediately to the north of the A14 has been mapped in detail as a mix of Grades 3a and 3b.

10.6.6. The sites are under an agri-environment scheme (Entry Level plus Higher Level Stewardship; **Figure 10.6.3**). None of the land is under a woodland grant scheme.

b) Environmental design and embedded mitigation

10.6.7. A summary of the measures that have been incorporated into the design of the proposed development and that would protect the existing features of soil and agricultural interest for either option is set out below.

i) Construction

10.6.8. The sustainable re-use of the soil resource would be undertaken in line with the Construction Code of Practice for the Sustainable Use of Soil on Construction Sites (Ref. 10.6.4). This would be achieved by the development of a Soil Management Plan (SMP) identifying the soils present, proposed storage locations and handling methods and how the resource will be re-used. The SMP would form part of the CEMP. Measures which would be implemented include (but are not limited to):

- completion of a Soil Resources Survey and incorporate results into a SMP;
- link the SMP to the Site Waste Management Plan (SWMP);
- ensure soils are stripped and handled in the driest condition possible;
- confine vehicle movements to defined haul routes until all the soil resource has been stripped;
- protect stockpiles from erosion and tracking over; and
- ensure physical condition of the entire replaced soil profile is sufficient for the post-construction use.

10.6.9. All soils would be stored away from watercourses (or potential pathways to watercourses) and any potentially contaminated soil would be stored on an impermeable surface and covered to reduce leachate generation and potential migration to surface waters.

10.6.10. Industry standard measures would be put in place to control pollution, including from fuel or chemical stores, silt-laden run-off or dust.

10.6.11. A considerate construction approach would be used to minimise potential impacts on the remainder of the landholding and on neighbouring landholdings during the construction phase. Toolbox talks would be used to inform all those working on the site of the requirements for soil handling and minimisation of disturbance to agricultural activities.

10.6.12. All fencing around the proposed development would be sufficient to resist damage by livestock and would be regularly checked and maintained in a suitable condition. Any damage to boundary fencing would be repaired immediately.

10.6.13. Measures contained in relevant Department for Environment, Food and Rural Affairs (Defra) and Environment Agency best practice guidance on the control and removal of invasive weed species would be implemented, where appropriate.

10.6.14. Works would cease, and the Animal Health Regional Office would be advised, should animal bones be discovered which indicate a potential burial site.

10.6.15. All movement of plant and vehicles between fields would cease in the event of a disease outbreak and official Defra advice would be followed to minimise the biosecurity risk associated with the continuation of works.

10.6.16. In relation to temporary and permanent land take requirements EDF Energy would liaise with landowners to understand and where possible address their concerns.

ii) Operation

10.6.17. The measures described for the construction phase would be maintained throughout the operational phase, as appropriate.

[Footnotes here]

iii) Removal and reinstatement

10.6.18. Following completion of construction operations all agricultural land taken temporarily would be fully reinstated as near as practically possible to its former condition. Topsoil would be prepared and seeded using an appropriate seed mix or returned immediately to cultivation depending on the time of year. Field drains would be reinstalled to reinstate any pre-existing field drainage systems to pre-construction condition.

c) Preliminary assessment of effects

10.6.19. The potential for significant effects on soils and agriculture for either option is discussed in this section. The assessment of significance is based on the embedded mitigation measures outlined above being in place.

i) Construction

10.6.20. The proposals for either option would result in the temporary loss of approximately 20.39ha of primary agricultural land and some of this land has the potential to be best and most versatile agricultural land. Given the potential extent of best and most versatile land to be lost this preliminary assessment considers that this could be a significant effect.

10.6.21. There could also be an impact on the agricultural enterprise because of the loss of a proportion of the productive land. This would be assessed on a case by case basis as required.

10.6.22. On the assumption that landowners' concerns are addressed, through appropriate mitigation, this preliminary environmental assessment considers that significant effects on the agricultural enterprise are unlikely to occur and so are not considered further.

ii) Operation

10.6.23. There would be no additional operational phase effects on the soil resource or agricultural enterprises for either option.

iii) Removal and reinstatement

10.6.24. All land would be returned to its existing agricultural use.

d) Additional mitigation and monitoring

10.6.25. There are no mitigation measures available for the loss of best and most versatile land. The effect would however be temporary and the land would be returned to agricultural use.

e) Preliminary assessment of residual effects

10.6.26. The embedded mitigation measures would ensure that the potential for significant effects is removed.

f) Completing the assessment

10.6.27. Once the proposals for the development as a whole are finalised, a full assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

10.6.28. An ALC survey would be undertaken across agricultural land within the site boundary to fully inform the assessment of impacts. In addition, landowner interviews would be undertaken to identify any changes in the operation of the agricultural business.

[Footnotes here]

Table 10.6.1 Summary of effects for construction phase

Soils and agriculture

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Agricultural land	Temporary loss of approximately 20.39ha of which at least a proportion is likely to be best and most versatile land.	The loss is temporary, and all land would be returned to agriculture.	Not significant	No adverse significant effects identified, additional mitigation measures are therefore not required.	Not significant
Agricultural businesses	Temporary impact due to the loss of a proportion of the productive land.	EDF Energy will liaise with landowners to seek to understand and address their concerns.	Not significant	No adverse significant effects identified; additional mitigation measures are therefore not required.	Not significant

Table 10.6.2 Summary of effects for operational phase and removal and restoration phase

Soils and agriculture

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Agricultural land	There are no significant effects identified during the operational phase.				
Agricultural businesses	There are no significant effects identified during the operational phase.				

[Footnotes here]

10.7. Noise and vibration

a) Baseline environment

10.7.1. Baseline survey work has yet to be undertaken for the freight management facility. However, consideration of the potential noise and vibration impacts may be made without reference to existing baseline values.

10.7.2. The noise and vibration sensitive receptors which are closest to the two options are, for Option 1: Keepers Cottage and Mill Plantation (which are more than 350m from the site boundary) and, for Option 2: Croft House. Both Options are close to the A14 which is a busy dual carriageway leading to the Port of Felixstowe and all noise sensitive receptors are likely to be exposed to relatively high levels of road traffic noise throughout a 24-hour period. These locations can be seen on **Figure 10.12.1**.

b) Environmental design and embedded mitigation

i) Construction and removal and reinstatement

10.7.3. The standard of good practice outlined in 'British Standard BS5228-1 Noise: 2009 + A1 2014 – Code of Practice for noise and vibration control at open construction sites' (Ref. 10.7.1), would be followed. Embedded mitigation for the control of noise and vibration at either location could include, but not be restricted to, the following measures:

- selection of quiet plant and techniques in accordance with good practice in BS5228 for all construction, demolition and earth moving activities;
- switching off equipment when not required;
- use of reversing alarms that ensure proper warning whilst minimising noise impacts off-site; and
- provision of training and instruction to construction site staff on methods and techniques of working to minimise off-site noise and vibration impacts.

10.7.4. BS 5228-2 gives detailed advice on standard good construction practice for minimising impacts from construction vibration. It is expected it would be a requirement of the contractors to adhere to this guidance which would be set out in the CEMP.

10.7.5. EDF Energy would also have a system for the receipt and recording of any noise or vibration complaints from occupiers of noise sensitive receptors, and procedures for investigating and acting appropriately as necessary upon those complaints.

ii) Operation

10.7.6. The possibility of embedding noise mitigation measures into the Option 2 site design will be considered, particularly, the site layout.

c) Preliminary assessment of effects

10.7.7. Noise and vibration levels have been predicted by calculation and modelling. A "significant" effect has been identified where levels are predicted to exceed a specified threshold value. Appropriate threshold levels are based on various standards and a relevant guidance and depend on the type of source; the sensitivity of the receptors; the time of day when it might occur; and, in some situations, on the existing noise levels in the area.

i) Construction and removal and reinstatement

10.7.8. A detailed analysis of noise and vibration impacts has not been carried out, but an initial overview of likely working techniques has enabled some initial high level conclusions to be drawn. These are described below. It is assumed that noisy work would take place outside of night time hours.

10.7.9. There would be no significant noise or vibration effects from construction activities from Option 1. Noise from construction activity from Option 2 would be likely to have a significant effect on Croft House.

10.7.10. A detailed analysis of vibration from construction has not yet been carried out. It is possible that a significant effect might occur if significant sources of vibration (such as vibratory compactors) are used within 20m of Croft House. Such effects would be short-term only. Further work is required to consider this in detail.

10.7.11. Noise and vibration levels at other receptors during construction are unlikely to have a significant effect.

ii) Operation

10.7.12. There is expected to be negligible non-significant noise effect during the operational period from Option 1. There would likely be a significant adverse noise effect from the operational phase for Option 2 at Croft House. Vibration impacts from the operational phase would be negligible and not significant.

10.7.13. For all other receptors the noise and vibration effects during the site's operational phase are not expected to be significant.

[Footnotes here]

d) Additional mitigation and monitoring

i) Construction and removal and reinstatement

10.7.14. No mitigation would be necessary for Option 1, but mitigation in the form of screening would likely be necessary around the areas of the site adjacent to Croft House during construction and removal and reinstatement for Option 2. Details of the screening would need to be designed once the methodologies are known.

ii) Operation

10.7.15. No mitigation would be necessary for Option 1, but some screening is likely to be needed around the site boundary with Croft House. The extent and size of this would need to be considered once more is known about the proposed site layout.

10.7.16. Routine monitoring would be carried out to a scheme to be agreed with local authorities. Provision would be made as necessary for monitoring of noise and vibration levels in the event of complaints being received from occupiers of noise sensitive receptors, or on request of the local authorities.

e) Preliminary assessment of residual effects

i) Construction and removal and reinstatement

10.7.17. With mitigation in place, it is likely that some significant, short-term effect from noise would occur during both the construction and removal and reinstatement phases at Croft House. Short-term vibration effects are also possible.

10.7.18. Principal noise sources are likely to be from excavators and bulldozers during stripping and tipper lorries, rollers and vibratory compactors during construction. During reinstatement, breaking out and demolition of hardstanding has the potential to result in significant noise effects. Initial estimates suggest that significant impacts are likely for two to four weeks although this may vary as construction planning evolves.

ii) Operation

10.7.19. Noise impacts for the operational phase would not be likely to be significant. Vibration impacts from the operational phase would be negligible and not significant.

f) Completing the assessment

10.7.20. Further assessment of impacts will be needed, in particular in respect of construction methodology, local topographical features and layouts. The ES will present a full noise and vibration assessment and will consider any new information such as amended design or construction methodologies which might be relevant, although it is anticipated that the assessment will support the preliminary conclusions drawn above.

[Footnotes here]

Table 10.7.1 Summary of effects for construction and removal and reinstatement phases

Noise and vibration

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Option 2: Croft House.	Noise from construction and removal and reinstatement works.	Selection of plant and methodology in accordance with good practice.	Short-term significant noise effect.	Screening	Short-term significant noise effect.
Option 2: Croft House.	Vibration from vibratory compactors if within 20m from Croft House .	Selection of plant and methodology in accordance with good practice.	Possible short-term significant vibration effect.	None	Possible short-term significant vibration effect.
All other receptors for both Option 1 and Option 2.	Noise and vibration from construction and removal and reinstatement activities.	Selection of plant and methodology in accordance with good practice.	No significant noise or vibration effect.	None	None

Table 10.7.2 Summary of effects for operational phase

Noise and vibration

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Option 2: Croft House.	Noise from operational phase.	Site layout and design may provide some scope for mitigation.	Significant noise effect.	Screening	No significant noise or vibration effect.
All other receptors for both Option 1 and Option 2.	Noise and vibration from operational phase.	None	No significant noise or vibration effect.	None	None

[Footnotes here]

10.8. Air quality

a) Baseline environment

10.8.1. The closest human receptors to the proposed development are located at isolated properties within 300m of the A14 corridor, relevant to both proposed options. Innocence Farm, Option 2, is more likely to adversely affect residential receptors in Trimley Saint Martin.

10.8.2. The closest ecological receptor to both of the sites is the Orwell Estuary SSSI, which is within 1km of the proposed development sites, and will therefore require consideration.

10.8.3. SCDC has declared two Air Quality Management Areas (AQMAs) within its boundary (Ref. 10.8.1) due to elevated monitored concentrations of ambient nitrogen dioxide (NO2), the nearest of which is approximately 8km from the site, along the A12 at Stratford St. Andrew. A third AQMA, at Dooley Inn, was revoked in 2016.

10.8.4. The current baseline at the proposed development has been informed by reference to Defra estimates of background concentrations for sulphur dioxide (SO2), NO2 and particulate matter (PM10 and PM2.5) (Ref. 10.8.2), and local authority measurement data (Ref. 10.8.3) for nitrogen dioxide. Baseline concentrations of all pollutants at receptors are less than half statutory objective values (Ref. 10.8.4).

10.8.5. Dust levels are related to the action of wind on exposed soils and climatic conditions year to year, but existing levels are likely to be low given the arable nature of the land use.

10.8.6. Ongoing achievement of air quality objective values is likely to occur within the study area in future years, with anticipated improvements to vehicle emission factors and background concentrations.

10.8.7. No notable changes are expected in land use in the surrounding area and it is expected that rates of dust deposition are likely to be similar to current levels.

b) Environmental design and embedded mitigation

i) Construction

10.8.8. The following mitigation measures would be embedded into the construction of the freight management facility at either location:

- site access located as far as practicable, and preferably at least 10m, from receptors;
- any potential use of concrete batching plant located as far as practicable from receptors; and
- mobile crushing and screening plant (if required) located as far as practicable from receptors.

10.8.9. Air quality impacts arising from the construction phase would be managed through a range of control measures detailed in a CEMP, supplemented by the measures appropriate to the level of risk designated to the proposed development under IAQM Guidance (Ref. 10.8.5).

ii) Operation

10.8.10. The following mitigation measure would be embedded into the operation of the proposed development; to maintain Sizewell C construction vehicles to high standard so as to avoid excess pollution or possibility of breakdowns.

10.8.11. Any other mitigation measures required would be managed and implemented through a site wide environmental sustainability plan.

iii) Removal and reinstatement

10.8.12. It is expected that the effects on air quality during the removal of the proposed development will be similar to the initial construction phase and the embedded mitigation employed would reflect that within the construction phase.

c) Preliminary assessment of effects

i) Construction

10.8.13. The potential impacts associated with the construction of either option include fugitive emissions of dust, emissions from non-road mobile machinery (NRMM) on the site, emissions from HGVs accessing the site and emissions from vehicles carrying workers to and from the site. However, given the embedded mitigation measures described above, it is likely the adverse effects would be negligible at either location and would therefore not be significant for any of the proposed construction activities.

10.8.14. The principal risk is anticipated to be related to earthworks, as this phase of construction can typically require a high volume of material to be moved, although the duration of works would be short. A high level of activity could potentially place the dust emissions category as 'large' by IAQM classification, with the likelihood of a 'low' risk based on the number and sensitivity of local receptors. Each risk category has the potential to lead to proportional adverse, albeit temporary, impacts which have the potential to be significant without mitigation.

10.8.15. However, assuming all mitigation measures are effectively implemented and monitored through an effective CEMP, at the level recommended by the dust risk assessment, no significant dust effects resulting from demolition and construction activities are anticipated.

10.8.16. It is expected that the number of Heavy Duty Vehicle (HDV) movements required to develop the site in the construction phase would not exceed the IAQM screening threshold (Ref. 10.8.6) of more than 100 Annual Average Daily Traffic required for a detailed dispersion modelling assessment and therefore it is unlikely there would be a significant air quality effect.

ii) Operation

10.8.17. There is potential for increases in pollutant concentrations at receptors located along the routes used by freight accessing the proposed development for either option. The primary source of these pollutants would be as a result of the additional vehicles, principally HGVs, using these roads.

10.8.18. Accordingly, IAQM guidance has been used to determine the necessity for an air quality impact assessment, and it is expected that the proposed development will require a detailed assessment, given it meets a number of IAQM criteria, including the increase of HDV vehicles. The low baseline concentrations across the two proposed option sites, indicates that there would be unlikely to be significant adverse air quality effects at receptors during operation.

10.8.19. There are not anticipated to be any significant effects on AQMAs from the proposed development, given their lack of proximity.

10.8.20. The impacts on both Orwell Estuary SSSI of the proposed development would likely be negligible as a percentage of the overall background deposition rates. Whilst there may be exceedances of critical loads immediately adjacent to roads, this would be attributable to background deposition, and not the development itself, and would in addition be expected to fall off rapidly with increased distance from the road. This would therefore not be significant.

10.8.21. The principal benefit to the proposed development is in reducing main development site related traffic avoiding travelling through smaller villages closer to Sizewell C, thus avoiding increasing pollutant concentrations at receptors in those locations. However, it is acknowledged that there would be a negligible adverse impact at some receptors close to the proposed development.

iii) Removal and reinstatement

10.8.22. It is expected that the effects on air quality during the removal of the proposed development at either location would be similar to the initial construction phase.

d) Additional mitigation and monitoring

10.8.23. No significant adverse effects are predicted for any phase of development for either option and no additional mitigation measures are therefore proposed.

e) Preliminary assessment of residual effects

10.8.24. No significant adverse residual effects are predicted during the construction, operational or removal and restoration phases for either option.

f) Completing the assessment

10.8.25. Once an option is selected and the proposals are finalised, the potential air quality effects of the proposed development will be re-evaluated to confirm whether the preliminary conclusions presented above are applicable. The ES will present the full assessment considered necessary for the proposed development, underpinning the conclusions drawn in relation to the absence of significant adverse effects.

Table 10.8.1 Summary of effects for construction phase (both options)

Air quality

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Construction Dust					
Human	Potential generation of nuisance dust.	As recommended in CEMP and appropriate to level of risk identified by IAQM criteria.	Considered likely to be 'medium' risk, though not significant provided CEMP mitigation measures are adhered to.	None	Not Significant
Ecological	Potential dust soiling for sensitive species.	As recommended in CEMP and appropriate to level of risk identified by IAQM criteria.	Considered likely to be 'medium', risk, though not significant provided CEMP mitigation measures are adhered to.	None	Not Significant
Vehicle/NRMM Emissions					
Human	Potential change in air pollutant concentration at receptors.	As recommended in CEMP.	Unlikely to meet IAQM screening criteria requiring assessment, therefore not significant.	None	Not Significant
Ecological	Potential increase in emissions.	As recommended in CEMP.	Unlikely to meet IAQM screening criteria requiring assessment.	None	Not Significant

Table 10.8.2 Summary of effects for operational phase (both options)

Air quality

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Vehicle Emissions					
Human	Emissions at receptors.	Maintain Sizewell C vehicles to high standard to reduce extra pollution.	Not likely to be significant.	None	Not Significant
Ecological	Emissions at receptors.	As above	Unlikely to have significant adverse effects.	None	Not significant

Table 10.8.3 Summary of effects for removal and reinstatement (both options)

Air quality

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Construction Dust during removal					
Human	Potential generation of nuisance dust.	As recommended in CEMP and appropriate to level of risk identified by IAQM criteria.	Considered likely to be 'medium', risk, though not significant provided CEMP mitigation measures are adhered to.	None	Not Significant
Ecological	Potential dust soiling for sensitive species.	As recommended in CEMP and appropriate to level of risk identified by IAQM criteria.	Considered likely to be 'medium', risk, though not significant provided CEMP mitigation measures are adhered to.	None	Not Significant
Vehicle/NRMM Emissions during removal					
Human	Potential increase in emissions.	As recommended in CEMP.	Unlikely to meet IAQM screening criteria requiring assessment, and therefore not significant.	None	Not Significant
Ecological	Potential increase in emissions.	As recommended in CEMP.	Unlikely to meet IAQM screening criteria requiring assessment, and therefore not significant.	None	Not Significant
Once reinstated to arable land					
All Receptors	No impact	None required	Not significant	None	Not Significant

10.9. Geology and land quality

a) Baseline environment

i) Geology

10.9.1. The following provides a summary of the geology and geological characteristics within both sites and the vicinity:

- made ground: potentially present, related to construction of existing roads, railway, Skouldings Pit, former sand and gravel pits and unmapped farmer's tips;
- superficial deposits: Kesgrave Catchment Subgroup (sand and gravel) deposits;
- bedrock: Crag Group;
- important geological sites: none present;
- identified geological hazards: none present;
- mining, quarrying and natural cavities: historical gravel pits identified within 500m of the site vicinity;
- ground stability hazards: none present; and
- unexploded ordnance risks: low risk.

10.9.2. Borehole logs indicate that groundwater can be found at around 5.5m below ground level (bgl).

ii) Hydrology and hydrogeology

10.9.3. The following provides a summary of the hydrological and hydrogeological characteristics within both sites vicinity:

- surface water features: there are several ponds, drainage ditches and unnamed streams located within 500m of each site vicinity;
- superficial aquifer: the Kesgrave catchment subgroup is classified as a Secondary A Aquifer;
- bedrock aquifer: the Crag Group is classified as a Principal Aquifer;
- groundwater vulnerability: the site contains soils of high leaching potential;
- groundwater/surface water abstractions: there are no licensed abstractions recorded within 500m of the site. However, a well is indicated to be present at Croft House adjacent to the northern corner of the site;
- groundwater/surface water discharge consents: there are discharge consents recorded within 500m of each site;
- pollution incidents: there are pollution incidents recorded within 500m of each site; and
- flood risk: very low risk.

iii) Site history

10.9.4. Both sites currently support agricultural land and this land use extends back into the 19th century at least. The surrounding area has also been predominantly used as agricultural land.

10.9.5. Potentially contaminating historical activities within 500m of the sites include the A14 (originally constructed as the A45 in the 1920s and upgraded to the A14 in early 1980s), Skouldings pit (1884) which was used as unlicensed refuse tip (1966 – 1988), a smithy (1881 – 1926), railway line (1881 – present), car dealers (unknown – present), former gravel pits (1881 – present), local roads (1881 – present) and farmland within the site vicinity (1881 – present).

iv) Landfills and waste management sites

10.9.6. No recorded landfills or waste management sites are located within 500m of each option. However, Skouldings Pit is shown as a refuse tip on historic maps although no further details are available in relation to the waste it received.

v) Previous investigations

10.9.7. There have been no previous ground investigations undertaken at the site.

vi) Key hazards

10.9.8. Key hazards present within each site vicinity include the following:

- made ground (off-site) associated with the construction and operation of the A14/A45 and local roads;
- made ground associated with the disused gravel pits identified 150m west and 400m north-east of Option 1;
- landfill/refuse tip located at Skouldings Pit;
- railway line, car dealership and smithy; and
- farmland on-site and within the wider site vicinity and the potential for un-mapped farmers tips.

vii) Summary of Preliminary Conceptual Site Model

10.9.9. A summary of potential contamination sources, pathways and receptors identified within the Preliminary Conceptual Site Model is provided in **Table 10.9.1**.

Table 10.9.1 Potential sources of contamination

Potential source of contamination	Potential contamination	Approximate location
Farmland within site boundary. Potential for un-mapped farmers' tips.	Contamination risk from herbicides, pesticides, silage, effluent, and fuel oils. Risk of inorganic and organic contamination including metals and hydrocarbons, PCBs, asbestos, etc.	On-site
Made ground associated with the construction of the A14 and local roads adjacent to the site, as well as activities associated with their operation.	Fuels and oils attributed to spills from vehicles on the roads included within the site boundary, plus exhaust particulates. A range of inorganic and organic contaminants including the potential for asbestos.	Off-site
Car dealership	Metal and organic contaminants including petroleum, petrol additives, diesel, oils/lubricants.	
Made ground associated with the construction of the railway line (Felixstowe Branch) and activities associated with its operation.	A range of inorganic and organic contaminants including metals, hydrocarbons, PCBs, PAHs, solvents and creosote.	
Farmland surrounding the site. Potential for un-mapped farmers' tips.	Contamination risk from herbicides, pesticides, silage, effluent, and fuel oils. Risk of inorganic and organic contamination including metals and hydrocarbons, PCBs, asbestos, etc.	
Former gravel pits located in the vicinity.	A range of inorganic and organic contaminants including metals and hydrocarbons and the potential for asbestos and ground gas generation.	
Unregistered refuse tip (Skouldings Pit) located to the north of each site.	Accepted waste is unknown but potential contaminants may include metals, inorganic and organic contaminants, fuels, oils, asbestos and a potential for vapour and/or ground gas generation .	
Smithy located to the south of both sites.	Metals, hydrocarbons, PCBs, PAHs and solvents.	Off-site

10.9.10. Potential receptors and pathways shown in **Table 10.9.2** comprise:

Table 10.9.2 Potential receptors and pathways

Receptor Group	Receptor	Principal Contaminant Migration pathways
Human Health (on-site).	Construction / maintenance workers.	Dermal contact with and ingestion of contaminants in soil, soil-derived dust and water. Inhalation of contaminants in soil, soil-derived dust and vapours.
	Users of the new freight management facility.	
	Residents in adjacent properties and users of neighbouring commercial properties.	
Human Health (off-site).	Pedestrians accessing surrounding roads and footpaths.	Dermal contact with and ingestion of contaminants in soil-derived dust and water. Inhalation of contaminants in soil, soil-derived dust and vapours.
	Agricultural workers.	
	Groundwater in Principal Bedrock Aquifer; and Secondary A Superficial Aquifer.	
Controlled Waters: Groundwater (on-site and off-site).	Surface watercourses/ponds within 250m of each site.	Leaching/migration of contaminants in soil to groundwater in underlying aquifers; and Migration of contaminated groundwater, ground gas and/or vapours along strata and preferential pathways such as service routes or differentially permeable strata.
Controlled Waters: Surface waters (off-site).	Existing on-site services and structures.	Discharge of contaminants entrained in groundwater and/or surface water run-off followed by overland flow and discharge.
Property (on-site and off-site): Historical burial mound.	Existing off-site services and structures.	Direct contact of contaminants in soil and/or groundwater with existing and proposed structures and buried services; and Migration of contaminated groundwater, ground gas and/or vapours along strata and preferential pathways such as service routes or differentially permeable strata.
	Proposed on-site services and structures.	
	Crops and livestock.	
	Suffolk River Valleys and Suffolk Coast and Heaths (off-site).	Direct contact, ingestion, inhalation and uptake of soil and water contamination by crops and/or livestock; and Migration of contaminated waters/ dust/fibres and subsequent uptake by crops or ingestion/inhalation/dermal contact by livestock.
Ecological (off-site).		Migration of contaminated waters/dust/fibres and subsequent uptake by flora or ingestion/ inhalation/ dermal contact by fauna.

b) Environmental design and embedded mitigation

i) Construction

10.9.11. A summary of the measures that would protect the land quality during construction for either option is set out below.

- The CEMP would specify measures required during enabling works and construction including the following:
  - minimising the area and duration of soil exposure and timely reinstatement of vegetation or hardstanding to prevent soil erosion and reduce temporary effects on soil compaction;
  - stockpile management (such as water spraying and avoiding over stockpiling to reduce compaction of soil and loss of integrity) to prevent windblown dust and surface water run-off;
  - implementation of appropriate dust suppression measures to prevent migration of contaminated dust;
  - implementation of working methods during construction to ensure that there is no surface water run-off from the works or any stockpiles into adjacent surface watercourses/leaching into underlying groundwater in accordance with best practice;
  - implementation of appropriate pollution incident control e.g. plant drip trays and spill kits; and
  - implementation of appropriate and safe storage of fuel, oils and equipment during construction.
- Remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) would be undertaken if further investigation and risk assessments deem necessary.
- Design of the freight management facility and the selection of construction materials would be in accordance with good practice at the time of the design. The design would be required to take into account the ground conditions.
- Design of any temporary drainage would consider the ground conditions including the permeability of the strata and the level of contamination present on-site.

ii) Operation

10.9.12. A summary of the measures that would be incorporated into the operational phase for either option and that would protect the land quality is set out below:

- the proposed development would be operated in accordance with the relevant regulations and good practice guidance.

iii) Removal and reinstatement

10.9.13. A summary of the measures that have been incorporated for either option and that would protect the land quality is set out below:

- the use of a CEMP as detailed above to cover the removal of the temporary freight management facility and the reinstatement of topsoil;
- implementation of a SWMP and removal of all wastes from site;
- use of a Materials Management Plan (MMP) to allow suitable materials to be placed back on-site; and
- remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) if deemed necessary.

c) Preliminary assessment of effects

i) Construction

10.9.14. The construction works for either option would potentially introduce new sources of contamination and disturb and mobilise existing sources of contamination through excavation and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off and ground gas migration pathways. With the embedded mitigation in place, construction activities should not increase the contamination risks presented at the site and an overall neutral effect is predicted at either location. These effects are considered to be not significant.

10.9.15. Effects during the construction phase are summarised in **Table 10.9.3**.

ii) Operation

10.9.16. The operational phase would potentially introduce new sources of contamination at the chosen location. Spillages and leaks may occur and below ground services could create additional potential pathways for the migration of potential contamination that were not present at baseline. With embedded mitigation measures in place, an overall neutral effect is anticipated for the chosen option. These effects are considered to be not significant.

10.9.17. Effects during the operational phase are summarised in **Table 10.9.4**.

Table 10.9.3 Construction phase effects for the proposed development (both options)

Receptor	Value/Sensitivity	Baseline risk	Construction risk	Effect
Human	High	Very low	Very low	Not significant
Controlled waters (groundwater).	Medium	Low	Very low	Not significant
Controlled waters (surface water).	Medium	Very low	Very low	Not significant
Property (existing/future structures and services).	Low	Very low	Very low	Not significant
Property (existing crops and future livestock).	Medium	Very low	Very low	Not significant
Ecological (Suffolk River Valleys and Suffolk Coast and Heaths).	High	Very low	Very low	Not significant

Table 10.9.4 Operational phase effects for the proposed development (both options)

Receptor	Value/Sensitivity	Baseline risk	Construction risk	Effect
Human	High	Very low	Very low	Not significant
Controlled waters (groundwater).	Medium	Low	Very low	Not significant
Controlled waters (surface water).	Medium	Very low	Very low	Not significant
Property (existing/future structures and services).	Low	Very low	Very low	Not significant
Property (existing/future crops and livestock).	Medium	Very low	Very low	Not significant
Ecological (Suffolk River Valleys and Suffolk Coast and Heaths).	High	Very low	Very low	Not significant

Table 10.9.5 Removal and reinstatement phase effects (both options)

Receptor	Value/Sensitivity	Baseline risk	Construction risk	Effect
Human	High	Very low	Very low	Not significant
Controlled waters (groundwater).	Medium	Low	Very low	Not significant
Controlled waters (surface water).	Medium	Very low	Very low	Not significant
Property (existing and future structures and services).	Low	Very low	Very low	Not significant
Property (existing/future crops and livestock).	Medium	Very low	Very low	Not significant
Ecological (Suffolk River Valleys and Suffolk Coast and Heaths).	High	Very low	Very low	Not significant

iii) Removal and reinstatement

10.9.18. The proposed development would be reinstated to the existing condition. With embedded mitigation incorporated into the design and effectively implemented during the construction and operation of the proposed development, there would be an overall neutral effect for either option. These effects would not be significant.

10.9.19. Effects during the post-operational phase are provided in **Table 10.9.5**.

d) Additional mitigation and monitoring

10.9.20. The preliminary assessment of effects presented above identifies no adverse significant effects during construction, operation and post-operation in relation to land quality for either option. Additional measures to mitigate significant adverse effects are not therefore required.

e) Preliminary assessment of residual effects

10.9.21. No additional mitigation is proposed beyond the embedded measures described above and the residual effects for all phases of development would remain the same as those described above in the preliminary assessment of effects. The effects would be neutral and would not be significant for either option.

f) Completing the assessment

10.9.22. Once the option is chosen and the proposals for the Sizewell C project development as a whole are finalised, a full land quality assessment of the proposals will be undertaken as part of the EIA and the results presented in the ES. The ES will present the full assessment underpinning the conclusions drawn in relation to significant effects.

10.9.23. A summary of the significance of overall effects is provided in **Table 10.9.6**, **Table 10.9.7** and Table **10.9.8**

Table 10.9.6 Summary of effects for construction phase (both options)

Geology and land quality

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Incorporate mitigation measures into the construction process, as set out in the CEMP.	Not significant	No adverse significant effects identified during construction works. Additional mitigation measures are not therefore required.	Not significant
Controlled waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant		Not significant
Property receptors (services/structures, crops and livestock).	Contamination from on-site sources.		Not significant		Not significant
Ecological (Suffolk River Valleys and Suffolk Coast and Heaths).	Contamination from on-site sources.		Not significant		Not significant

Table 10.9.7 Summary of effects for operational phase (both options)

Geology and land quality

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Construction methodology and associated mitigation measures will prevent impacts during operation. The project will be operated in accordance with the relevant regulations and good practice.	Not significant	No adverse significant effects identified during operation. Additional mitigation measures are not therefore required.	Not significant
Controlled waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant		Not significant
Property receptors (services/structures, crops and livestock).	Contamination from on-site sources.		Not significant		Not significant
Ecological (Suffolk River Valleys and Suffolk Coast and Heaths).	Contamination from on-site sources.		Not significant		Not significant

Table 10.9.8 Summary of effects for operational phase (both options)

Geology and land quality

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Incorporate mitigation measures into the CEMP, including the adoption of working methods to appropriately manage dust generation, pollution incidents, surface water run-off and groundwater during deconstruction/ demolition. Validation of the site and remediation of soil/groundwater contamination if investigation and risk assessments deem necessary.	Not significant	No adverse significant effects identified during post-operation. Additional mitigation measures are not therefore required.	Not significant
Controlled waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant		Not significant
Property receptors (services/structures, crops and livestock).	Contamination from on-site sources.		Not significant		Not significant
Ecological (Suffolk River Valleys and Suffolk Coast and Heaths).	Contamination from on-site sources.		Not significant		Not significant

10.10. Groundwater

a) Baseline environment

10.10.1. Details on the geology for both options are provided in the **Geology and land quality section 10.9**.

10.10.2. The Kesgrave Catchment Subgroup (sands and gravels) is classified as a Secondary A Aquifer[7] (Ref. 10.10.1).

10.10.3. The Crag Group bedrock underlying both sites in classified as a Principal Aquifer[8].

10.10.4. The two options do not lie within a groundwater Source Protection zone (SPZ)[9].

10.10.5. Where superficial deposits of the Kesgrave Catchment Subgroup and Made Ground are present, there is potential for there to be a varying degree of connectivity to the underlying Crag bedrock aquifer. However, where superficial deposits and Made Ground are not present and due to the highly permeable nature of sands and gravels, it is anticipated there will be a high degree of connectivity between the Kesgrave Catchment Subgroup and underling Crag Group.

10.10.6. Contours shown on British Geological Survey (BGS) hydrogeological mapping (Ref. 10.10.2) suggest that Crag groundwater levels at the sites may be 15m Above Ordnance Datum (AOD), approximately 10m bgl. These contours are based on data from 1976 and are only indicative of current levels, however the hydrogeological regime is not considered likely to have changed significantly in the intervening years.

10.10.7. Both site options are located on the Felixtowe Peninsula Crag and Chalk groundwater body (Water Framework Directive reference GB40501G401800) (Ref. 10.10.3). This groundwater body has been classified as being of Good quantitative and Poor chemical status, with an overall water body classification of Poor. The Poor chemical status has been attributed to impacts from agriculture as evidence by elevated nitrate concentration in groundwater. The site falls within a groundwater Nitrate Vulnerable Zone.

10.10.8. There are no licensed abstractions recorded within 500m of either option. However, a well is indicated to be present at Croft House, adjacent to the northern corner of Option 2.

10.10.9. The Suffolk Coastal and Waveney District Strategic Flood Risk Assessment (SFRA) makes no reference to groundwater flooding across the Suffolk Coastal and Waveney District (Ref. 10.10.4). Flood risk is discussed further below.

10.10.10. There is no known existing land contamination on the sites. Further information on land quality is presented in **section 10.9**.

b) Environmental design and embedded mitigation

i) Construction

10.10.11. Construction drainage would be contained within the sites, with infiltration to ground.

10.10.12. CEMP would specify measures required during construction which could include, but not be limited to:

- implementation of working methods during construction to ensure there would be no surface water run-off from the works, or any stockpiles, into adjacent surface watercourses/leaching into underlying groundwater, in accordance with best practice;
- implementation of appropriate pollution incident control e.g. plant drip trays and spill kits;
- implementation of appropriate and safe storage of fuel, oils and equipment during construction;
- implementation of an appropriate MMP to document how the excavated materials will be dealt with; and
- implementation of a SWMP.

10.10.13. Remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) and ground stabilisation/improvement works would be undertaken if further investigation and risk assessments deemed it necessary.

10.10.14. The drainage/flood prevention strategies would consider the ground conditions including the permeability of the strata and the level of contamination present on-site.

[7] Secondary A Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

[8] Principal Aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

[9] Groundwater Source Protection Zones are areas defined around groundwater sources used for public drinking water supply. The SPZ shows the risk of contamination from activities that might cause pollution in the area. The closer the activity, the greater the risk.

ii) Operation

10.10.15. Appropriate drainage would be used, including the incorporation of SuDS measures.

10.10.16. Petrol/oil interceptors would be incorporated within the drainage design where considered necessary.

iii) Removal and reinstatement

10.10.17. The site would be returned to its current existing use (i.e. agriculture).

10.10.18. The removal of the proposed development would include the removal of any related drainage and SuDS measures. Any measures used to protect groundwater during construction would also be applied during the decommissioning phase.

c) Preliminary assessment of effects

i) Construction

10.10.19. Due to the shallow excavation depths, it is considered unlikely there would be an impact on the groundwater level and flow regime.

10.10.20. Were a spill or leak to occur during construction, the impact on groundwater within superficial deposits would be low and the effect not significant.

10.10.21. Given the relatively low volumes of potentially contaminative material, the scale of any spill or leak would be small. The impact on the Kesgrave Catchment Subgroup and Crag groundwater would be low and the effect not significant.

10.10.22. Considering both the baseline conditions of the sites and the environmental design and embedded mitigation, there would be no significant adverse groundwater effects at either site.

ii) Operation

10.10.23. The proposed works would not significantly increase the impermeable area of ground cover at the two development site options relative to the groundwater system. Appropriate drainage would be used, including the incorporation of SuDS measures.

10.10.24. The operation could potentially introduce new sources of contamination. Spillages and leaks could occur and below ground services could create additional potential pathways for the migration of potential contamination that were not present at baseline. With embedded mitigation however, an overall neutral effect is anticipated.

10.10.25. Considering both the baseline conditions of the sites and the environmental design and embedded mitigation, there would be no significant groundwater effects at the sites.

iii) Removal and reinstatement

10.10.26. The proposed development would be reinstated to the existing condition. With embedded mitigation incorporated into the design and effectively implemented during the construction and operation of the proposed development, there would be an overall neutral effect.

d) Additional mitigation and monitoring

10.10.27. Periodic inspection and maintenance of the drainage infrastructure would be required to ensure its continued efficacy.

e) Preliminary assessment of residual effects

10.10.28. There are not expected to be any significant adverse residual effects during the construction, operation or removal and reinstatement phases.

f) Completing the assessment

10.10.29. Once the proposals for the Sizewell C development as a whole are finalised, the full groundwater assessment of the proposals would be completed as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 10.10.1 Summary of effects for construction phase

Groundwater

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Crag groundwater (Principal Aquifer); Kesgrave sand and gravel (Secondary A Aquifer); Groundwater abstractions (within 1km of site boundary).	Leaching and migration of existing contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers.	Ensuring all site activities are carried out in accordance with the CEMP; Remediation of on-site contamination if required.	Not significant	No adverse significant effects identified during construction works. Additional mitigation measures are not therefore required.	Not significant
	Migration of contaminants via preferential pathways to deeper groundwater.		Not significant		Not significant
	Construction materials and the use of construction vehicles have the potential to introduce contamination to groundwater via drips and spillages and infiltration of run-off from the construction site.		Not significant		Not significant

Table 10.10.2 Summary of effects for operation phase

Groundwater

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Crag groundwater (Principal Aquifer); Kesgrave sand and gravel (Secondary A Aquifer); Groundwater abstractions (within 1km of site boundary).	Increase in the impermeable area of ground cover at the development site.	Water draining from the site would pass through appropriate drainage, including the incorporation of SuDS and petrol/oil interceptors where necessary. This would allow infiltration to the superficial aquifer, whilst also protecting the underlying groundwater from hydrocarbon contamination.	Not significant	Periodic inspection and maintenance of the SuDS infrastructure.	Not significant
	Spills or leaks infiltrating to groundwater.		Not significant		Not significant
	Creation of new contamination pathways.		Not significant		Not significant

Table 10.10.3 Summary of effects for removal and reinstatement phase

Groundwater

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Crag groundwater (Principal Aquifer); Kesgrave sand and gravel (Secondary A Aquifer); Groundwater abstractions (within 1km of site boundary).	Leaching and migration of existing contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers.	Ensuring all site activities are carried out in accordance with the CEMP; Remediation of on-site contamination if required; Appropriate drainage design.	Not significant	No adverse significant effects identified during Removal and reinstatement. Additional mitigation measures are not therefore required.	Not significant
	Migration of contaminants via preferential pathways to deeper groundwater.		Not significant		Not significant
	Construction materials and the use of construction vehicles have the potential to introduce contamination to groundwater via drips and spillages and infiltration of run-off from the construction site.		Not significant		Not significant

10.11. Surface water

a) Baseline environment

i) Surface water features

10.11.1. Option 1 is not located within a river water body catchment. The north-eastern boundary of the site intersects a balancing pond for the A14. A raised agricultural reservoir and pond are located in the vicinity of the site.

10.11.2. Option 2 is located immediately adjacent to an artificial drain which runs along the western edge of the site. A reservoir, north of Stratton Hall Solar Farm, and ponds, south of the Solar Farm, are located to the north-west of the site. The site lies within the Bucklesham Mill River water body, but the reportable reach for the water body is approximately 3km from the site.

ii) Water quality

10.11.3. Physico-chemical and chemical data presented on Catchment Data Explorer have been reviewed for Bucklesham Mill River (Ref. 10.11.1).

10.11.4. Physico-chemical data indicate that Bucklesham Mill River is at High or Good Water Framework Directive (WFD) status for ammonia, biochemical oxygen demand (BOD), dissolved oxygen (DO), pH, phosphate and temperature.

b) Environmental design and embedded mitigation

i) Construction

10.11.5. At the chosen location, surface water run-off would be contained within the site, with drainage to ground wherever feasible. This would prevent the supply of sediment and other contaminants to the surface drainage network during construction. Areas currently at risk from surface water flooding would be considered in the construction phase drainage design.

10.11.6. Petrol/oil interceptors would be incorporated within the drainage infrastructure where considered necessary.

10.11.7. Mitigation measures would be incorporated into the construction process and could include, but not be limited to:

- the wheels of all vehicles would be washed before leaving site;
- concrete and cement mixing and washing areas would be situated at least 10m away from surface water receptors. These areas would incorporate settlement and recirculation systems to allow water to be re-used. All washing out of equipment would be undertaken in a contained area and all water would be collected for off-site disposal;
- all fuels, oils, lubricants and other chemicals would be stored in an impermeable bund with at least 110% of the stored capacity. Spill kits would be available at all times, and damaged containers would be removed from site. All refuelling would take place in a dedicated impermeable area, using a bunded bowser. Biodegradable oils would be used where possible; and
- sand bags or stop logs would also be available for deployment on the outlets from the site drainage system in case of emergency spillages.

ii) Operation

10.11.8. The operational drainage system would incorporate SuDS measures where appropriate, to minimise potential impacts on surface water receptors.

10.11.9. Petrol/oil interceptors would be incorporated within the drainage infrastructure where considered necessary.

iii) Removal and reinstatement

10.11.10. Once the site is no longer needed for use as a freight management facility, the land would be returned to its existing agricultural use.

c) Preliminary assessment of effects

i) Construction

10.11.11. The site which is used would likely be isolated from adjacent land areas, with drainage to ground. As a result, run-off from the site would be intercepted and unlikely to have an off-site impact on surface water.

10.11.12. Considering both the baseline conditions of the sites and the environmental design and embedded mitigation, it is unlikely there would be any significant adverse effects on surface water.

ii) Operation

10.11.13. Standard drainage measures, including SuDS measures, would be employed for either option and, although the drainage design requires further development, EDF Energy does not believe the proposed development would significantly increase surface water run-off from the site.

10.11.14. Considering both the baseline conditions and the environmental design and embedded mitigation, it is unlikely there would be any significant adverse effects on surface water for either option.

iii) Removal and reinstatement

10.11.15. Removal and reinstatement effects would be equivalent to the construction phase. Consequently, considering both the baseline conditions of the sites and the environmental design and embedded mitigation, it is unlikely there would be any significant adverse effects on surface water for either option.

d) Additional mitigation and monitoring

10.11.16. Periodic inspection and maintenance of the drainage infrastructure would be required to ensure its continued efficacy.

e) Preliminary assessment of residual effects

10.11.17. No significant adverse residual effects are expected during the construction, operational and removal and reinstatement phases for either option.

f) Completing the assessment

10.11.18. It is anticipated that effective mitigation can be provided for the proposed development at either location that would minimise surface water impacts. The final design of the proposed development, the need for mitigation and its form would be determined in liaison with the relevant authorities.

10.11.19. Once the proposals for the Sizewell C development are finalised, a full assessment of potential effects on the surface water environment from the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 10.11.1 Summary of effects for construction phase (both options)

Surface water

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Bucklesham River Other surface water features.	Contamination	Surface water containment. Petrol/oil interceptors where required. CEMP measures including adoption of pollution prevention measures (e.g. wheel washing and separation of working areas from surface waters).	Not significant	Periodic inspection and maintenance of the drainage infrastructure would be required to ensure its continued efficacy throughout the construction period.	Not significant

Table 10.11.2 Summary of effects for operational phase (both options)

Surface water

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Bucklesham River	Contamination	SuDS drainage features will be incorporated into the drainage design.	Not significant	Active management and maintenance of the drainage system to maximise its efficacy.	Not significant
Other surface water features.					

Table 10.11.3 Summary of effects for removal and reinstatement phase (both options)

Surface water

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Bucklesham River	Contamination	Surface water containment. Petrol/oil interceptors where required. CEMP measures including adoption of pollution prevention measures (e.g. wheel washing and separation of working areas from surface waters).	Not significant	Periodic inspection and maintenance of the drainage infrastructure would be required to ensure its continued efficacy until the drainage is ultimately removed in the later stages of reinstatement.	Not significant
Other surface water features.					

10.12. Flood risk

10.12.1. The figures for flood risk are presented in **Volume 3** as **Figures 10.12.1** to **10.12.2**.

a) Baseline environment

i) Option 1

10.12.2. The site has relatively flat topography with ground levels around 25m AOD.

10.12.3. The bedrock geology is the Red Crag Formation, formed of sand. The superficial geology is the Kesgrave Catchment Subgroup, formed of sand and gravel. The soils on-site are freely draining, slightly acid loamy soils.

10.12.4. The site is approximately 2.5km south of Mill River and 2.7km north of the River Orwell. The site is elevated well above these rivers and located entirely within Flood Zone 1. There is a low risk of river and coastal flooding.

10.12.5. There are two connected balancing ponds adjacent to the north-eastern boundary of the site that may be associated with highway drainage from the A14. There is potential for unidentified drainage ditches to be on-site.

10.12.6. The majority of the site has a very low surface water flood risk. There are several small areas with a low surface water flood risk, predominantly in the northern corner of the site, adjacent to the A14 (**Figure 10.12.2**).

10.12.7. Given the elevations and permeable geology, the overall risk of groundwater flooding to any significant depth across the site is considered to be low.

10.12.8. Sewers may be located within the proposed site area, however with a rural location and no recorded incidents of sewer flooding, the risk of sewer flooding is likely to be low.

10.12.9. A summary of the baseline flood risk for Option 1 is presented in **Table 10.12.1**.

ii) Option 2

10.12.10. The site is relatively flat with ground levels around 25m AOD.

10.12.11. The bedrock geology is the Red Crag Formation, formed of sand. The superficial geology is the Kesgrave Catchment Subgroup, formed of sand and gravel. The soils on-site are freely draining, slightly acid loamy soils.

10.12.12. The site is approximately 2.8km south of Mill River and approximately 2km north of the River Orwell. The site is elevated well above these rivers and located entirely within Flood Zone 1 (**Figure 10.12.1**). There is a low risk of river and coastal flooding.

10.12.13. The majority of the site has a very low surface water flood risk. There is a small area of low surface water flood risk close to site's north-western boundary, adjacent to Croft Lane (**Figure 10.12.2**).

Table 10.12.1 Summary of the baseline flood risk for the freight management facility Option 1

Source of flooding	Flood risk
Fluvial	Low: In Flood Zone 1, less than 1 in 1,000 annual probability of river flooding in any year (<0.1%).
Tidal/coastal	Low: In Flood Zone 1, less than 1 in 1,000 annual probability of sea flooding in any year (<0.1%).
Surface water (pluvial)	Predominantly Very Low: less than 1 in 1,000 annual probability of surface water flooding in any year (<0.1%). Small localised areas of Low, mainly in northern corner: between 1 in 1,000 and 1 in 100 annual probability of surface water flooding in any year (0.1% - 1%).
Groundwater	Low: No records of groundwater flooding in the SFRA.
Sewers	Low: agricultural land adjacent to the A14 and Felixstowe Road, sewers may be located on or near site.
Reservoirs	Not at risk of flooding from reservoirs.

10.12.14. Given site elevations and the permeable geology, the overall risk of groundwater flooding to any significant depth across the site is considered to be low.

10.12.15. Sewers may be located within the proposed site area. Due to the rural location and no recorded incidents of sewer flooding, it is considered that the risk of sewer flooding is likely to be low.

10.12.16. A summary of flood risk for Option 2 is presented in **Table 10.12.2**.

b) Environmental design and embedded mitigation

i) Option 1

10.12.17. The Sequential Test aims to steer new development away from areas of high flood risk. The positioning of the site in Flood Zone 1 complies with this requirement. There would be no loss of functional floodplain.

Construction

10.12.18. It is assumed that the two existing balancing ponds adjacent to the A14 would be retained.

10.12.19. It is likely the majority of the site would be isolated from adjacent land parcels by the construction of shallow perimeter bunds at an early stage of construction, ensuring surface water run-off would be contained within the site and then infiltrated to ground. A perimeter ditch would likely be constructed immediately outside of the proposed bunds to capture any off-site run-off that would otherwise have flowed onto the site.

10.12.20. Monitoring and maintenance of the drainage system would be carried out to preserve its integrity and maintain its design capacity.

Operation

10.12.21. It is likely that infiltration to ground would be viable at this site. SuDS would be implemented to provide a natural approach to managing drainage. Where possible this would include the use of permeable surfaces that would allow rainwater to infiltrate straight into the ground. Where that is not possible (or not appropriate), the drainage system would route surface water to swales or detention ponds, from where it would infiltrate to ground.

10.12.22. Climate change would be considered and the design would take account of future changes in rainfall intensity. The drainage design would also consider exceedance flows to limit water depths. This would be achieved by using the site topography to direct surface water flows to less critical areas of the site, from where water would then infiltrate to ground.

10.12.23. Run-off from any buildings would be disposed to soakaways. Buildings on the site would be constructed in line with standard flood resistant design; this could include measures such as a finished floor level raised above the finished ground level (to prevent surface water ingress), the use of damp proof membranes and sloping the ground levels away from the buildings.

Table 10.12.2 Summary of the baseline flood risk for the freight management facility Option 2

Source of flooding	Flood risk
Fluvial	Low: In Flood Zone 1, less than 1 in 1,000 annual probability of river flooding in any year (<0.1%).
Tidal/coastal	Low: In Flood Zone 1, less than 1 in 1,000 annual probability of sea flooding in any year (<0.1%).
Surface water (pluvial)	Predominantly Very Low: less than 1 in 1,000 annual probability of surface water flooding in any year (<0.1%). Small localised area of Low on the north-western boundary: between 1 in 1,000 and 1 in 100 annual probability of surface water flooding in any year (0.1% - 1%).
Groundwater	Low: No records of groundwater flooding in the SFRA.
Sewers	Low: agricultural land adjacent to the A14, Croft Lane and isolated residential dwellings, sewers may be located on or near site.
Reservoirs	Not at risk of flooding from reservoirs.

10.12.24. Monitoring and maintenance of the drainage system would be carried out to preserve its integrity and maintain its design capacity.

Removal and reinstatement

10.12.25. When the site is no longer required for use a freight management facility by EDF Energy the site would be returned to its existing agricultural use.

10.12.26. The removal of the proposed development would include the removal of any related drainage and SuDS measures.

ii) Option 2

10.12.27. The Sequential Test aims to steer new development away from areas of high flood risk. The positioning of the site in Flood Zone 1 complies with this requirement. There would be no loss of functional floodplain.

Construction

10.12.28. It is likely the majority of the site would be isolated from adjacent land parcels by the construction of shallow perimeter bunds at an early stage of construction, ensuring surface water run-off would be contained within the site and then infiltrated to ground. A perimeter ditch would likely be constructed immediately outside of the proposed bunds to capture any off-site run-off that would otherwise have flowed onto the site.

10.12.29. Monitoring and maintenance of the drainage system would be carried out to preserve its integrity and maintain its design capacity.

Operation

10.12.30. Infiltration to ground is likely to be viable at this site SuDS would be implemented to provide a natural approach to managing drainage. Where possible this would include the use of permeable surfaces that would allow rainwater to infiltrate straight into the ground. Where that is not possible (or appropriate), the drainage system would route surface water to swales or detention ponds from where it would infiltrate to ground.

10.12.31. Climate change would be considered and the design would take account of future changes in rainfall intensity. The drainage design would also consider exceedance flows to limit water depths.

10.12.32. Run-off from any buildings would be disposed to soakaways. Buildings on the site would be constructed in line with standard flood resistant design; this could include measures such as a finished floor level raised above the finished ground level (to prevent surface water ingress), the use of damp proof membranes and sloping the ground levels away from the buildings.

10.12.33. Monitoring and maintenance of the drainage system would be carried out to preserve its integrity and maintain its design capacity.

Removal and reinstatement

10.12.34. When the site is no longer required for use a freight management facility by EDF Energy it is expected that the site would be returned to a greenfield state.

10.12.35. The removal of the proposed development would include the removal of any related drainage and SuDS measures.

c) Preliminary assessment of effects

10.12.36. During all phases, the use of relatively standard drainage measures, combined with the site's existing overall low flood risk, means it is unlikely there would be any increase in off-site flood risk. The same drainage measures would manage on-site flood risk to acceptable levels and there would be no significant effects on flood risk.

d) Additional mitigation and monitoring

10.12.37. Monitoring and maintenance of the drainage system would be carried out to preserve its integrity and maintain its design capacity

e) Preliminary assessment of residual effects

10.12.38. Monitoring and maintenance of the drainage infrastructure, together with design for exceedance flows, would manage residual flood risk, so there would be no significant residual effects.

f) Completing the assessment

10.12.39. A full flood risk assessment for this site would be submitted as part of the application for development consent after the proposals for the Sizewell C development as a whole are finalised.

Table 10.12.3 Summary of effects for construction phase (both options)

Flood risk

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Surface water	Increase in impermeable area and associated surface water run-off during construction of site.	Shallow perimeter bunds constructed to contain surface water run-off on-site. Monitoring and maintenance of bund to preserve integrity and maintain design standards.	Not significant	None	Not significant
	Off-site surface water stopped from flowing across the site.	Perimeter ditch constructed outside of the perimeter bunds to intercept off-site surface water flows including an allowance for climate change to infiltrate to ground. Monitoring and maintenance of bund to preserve integrity and maintain design standards.	Not significant	None	Not significant

Table 10.12.4 Summary of effects for operation phase (both options)

Flood risk

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Surface water	Increase in impermeable area and associated surface water run-off from the site.	Surface water from impermeable areas discharged to infiltration SuDS including an allowance for climate change and incorporate the management of existing areas flood risk. Monitoring and maintenance of bund to preserve integrity and maintain design standards.	Not significant	None	Not significant
	Construction of buildings on-site that could be flooded.	All buildings on-site to be constructed with standard flood resistant design to prevent water ingress. Monitoring and maintenance of bund to preserve integrity and maintain design standards.	Not significant	None	Not significant

Table 10.12.5 Summary of effects for removal and reinstatement phase (both options)

Flood risk

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Surface water	Decrease in impermeable area and associated surface water run-off from the site.	None	Not significant	None	Not significant

10.13. Traffic and transport

10.13.1. Either site option is likely to have some effects on the local highway network during construction, operation and removal and restoration phases. The principal likely significant adverse and beneficial effects are explained below.

a) Baseline environment

i) Highway network

10.13.2. The A12 and A14 meet at Seven Hills, a grade-separated junction where a bridge carries the A14 over a roundabout where the A12 (towards Woodbridge) and the A1156 (towards Ipswich) meet the A14 slip roads. The roads are dual carriageways with the exception of the A1156 which is a single carriageway road.

10.13.3. The A14 is a trunk road that carries large volumes of traffic including HGVs travelling to and from the Port of Felixstowe. Both the A12 and A1156 are important roads serving Lowestoft, Ipswich and the surrounding region.

10.13.4. The average daily weekday flow on the A14 west of Seven Hills is 56,900 vehicles (Base Year), predicted to rise in the Reference Case (the projected traffic in 2027 without Sizewell C construction traffic) to 69,550. East of Seven Hills, the Base Year average daily weekday flow on the A14 is 44,850 vehicles, rising to 53,300 in the Reference Case.

10.13.5. The Seven Hills junction has been the site of 26 accidents in the past five years[10], although only two were serious in nature and there were no fatalities. The accidents are clustered at the give way lines entering the roundabout, indicating a propensity for shunt accidents.

10.13.6. A further 15 accidents have occurred on the A14 between the A12 and Croft Lane, of which one was fatal and another was serious.

ii) Public rights of way network

10.13.7. There are several PRoW in the vicinity of both options. **Section 10.4** provides further details.

b) Environmental design and embedded mitigation

i) Construction

10.13.8. Both options are located adjacent to the A14 trunk road, and therefore construction materials would be able to reach either site using high-capacity roads which already handle high volumes of HGVs.

10.13.9. Option 1 is located adjacent to the A12/A14 grade separated junction and is proposed to be accessed from Old Felixstowe Road via a new priority junction along the northern side of Old Felixstowe Road.

10.13.10. The location of construction site accesses close to, but not directly along, the A12 and A14 would mean that construction traffic can benefit from proximity to these trunk roads without causing noticeable disruption to traffic flow along them.

10.13.11. The A14 is a dual carriageway at the point where it passes south of the Innocence Farm site. Option 2 is located immediately north of the A14, on the eastern side of Croft Lane.

10.13.12. Construction traffic for Option 2 would be able to access the site from the west (the anticipated direction of approach for the majority of materials and staff) via a left turn into Croft Lane and then a right turn into the site. Traffic approaching from the east would need to U-turn at the Seven Hills junction. Vehicles exiting the Innocence Farm site towards destinations to the west would need to travel east along the A14 and U-turn at the Kirton/Trimley St Martin junction.

10.13.13. This access arrangement mitigates against potential delays or safety risks on the A14 by allowing large and/or slow vehicles to first turn off the A14 and subsequently to enter the site from Croft Lane.

ii) Operation

10.13.14. The freight management facility would be used primarily by HGVs whilst awaiting a departure slot to proceed to the Sizewell C main development site.

10.13.15. The operational hours for the freight management facility would vary but could be up to 24 hours a day, seven days a week, during the peak construction period of Sizewell C.

10.13.16. Provision of a freight management facility at either location would represent a significant form of embedded mitigation with regards to the wider transport network.

10.13.17. By holding HGVs at the freight management facility until such time as they are directed to Sizewell C, the flow of Sizewell C construction traffic on the A12 and local roads could be regulated. Benefits of this would include:

- allowing HGVs to use the trunk road network at night and access the Sizewell C main development site during the day. By providing this flexibility of timing, the impact of Sizewell C construction traffic on existing peak time traffic on Suffolk roads could be reduced;

[10] 2013 to 2017, the most recent five years for which data is available

- encouraging HGV fleet operators to use the trunk road network, rather than seeking shortcuts across secondary routes which may be perceived to offer more opportunities for parking. The freight management facility would include facilities which drivers are likely to prefer;
- providing a means of mitigation in the event of disruption on the A12 or local access roads. Provision of a freight management facility would allow HGVs to park in a safe and suitable location which does not impede existing road traffic, until such time as the disruption has cleared. This would reduce the strain on other new highways infrastructure further north, particularly the temporary HGV holding area at the proposed southern park and ride site.

10.13.18. Operational access to Option 1 would be via Old Felixstowe Road, and then left into the site. Exiting vehicles would turn right out of the site onto Old Felixstowe Road and then onto the Seven Hills roundabout.

10.13.19. Option 1 is adjacent to the A12/A14 junction and away from residential areas. Traffic volumes on Old Felixstowe Road are low and the turning movement in and out of the freight management facility would not have a noticeable impact on existing traffic movement.

10.13.20. The majority of construction materials are anticipated to be transported from the west. Consequently, only HGVs from the Innocence Farm site are expected to U-turn at the Kirton/Trimley St Martin junction during the daytime.

c) Preliminary assessment of effects

i) Construction

10.13.21. It is expected that it would take four to five months to construct the freight management facility and would require approximately 40 workers per day to construct the facility. Up to 30 HGVs per day would be expected to enter and exit the site during construction.

10.13.22. For Option 1, some short-term disruption to traffic flow could be experienced during construction of the site access. The construction site access would be on Old Felixstowe Road, now lightly used as through traffic travels between Seven Hills and Trimley St Martin on the A14 rather than along Old Felixstowe Road. The impact of this construction activity on traffic flow would not be significant.

10.13.23. The construction of a freight management facility at Option 2 is not currently anticipated to require changes to the existing junction of the A14 with Croft Lane.

10.13.24. Construction of the new site access on Croft Lane is likely to necessitate its temporary closure. Existing traffic volumes on this road are low, and an alternative route between the A14 and Kirton is available using the Kirton/Trimley St Martin junction. Inconvenience to existing road users would not be significant.

ii) Operation

10.13.25. The volumes of vehicles using the freight management facility would be low compared to the existing volumes using the A14, even at night. As a result, the operation of the freight management facility at either of the proposed locations would have a negligible impact on through traffic flow.

iii) Removal and reinstatement

10.13.26. There would be minor adverse effects on traffic delay during the removal of the freight management facility and its restoration to its existing agricultural use. Such effects would be similar to the effects arising during the construction phase.

d) Additional mitigation and monitoring

i) Construction

10.13.27. Diversion of vehicles on Old Felixstowe Road during construction of the site access may require monitoring of the impact on existing traffic along this route.

ii) Operation

10.13.28. No additional mitigation or monitoring is anticipated to be required during the operation of the freight management facility.

e) Preliminary assessment of residual effects

i) Construction

10.13.29. The residual effects during construction are anticipated to be the same as those set out under preliminary effects described above.

ii) Operation

10.13.30. The residual effects during operation are anticipated to be the same as those set out under preliminary effects described above.

f) Completing the assessment

10.13.31. Once a preferred freight management facility site is selected, and its design has been developed further and in more detail, the environmental assessment can be further refined.

10.14. A comparison of the two freight management facility site options

10.14.1. The two options for the freight management facility are situated in close proximity to each other and the broader environmental constraints in both locations are therefore similar. Both options comprise predominantly arable fields and the potential for significant adverse effects is similar at both. Based on the preliminary assessment to date, the one exception is that Option 2 is more likely to generate a significant noise effect (at one receptor) during both the construction and removal and reinstatement phases, although that effect would be relatively short-term.

10.15. A comparison of the rail-led and road-led strategies

10.15.1. The freight management facility would only be built under a road-led strategy and so the environmental effects described in this chapter would only arise under the road-led strategy.

[Footnotes here]

11. Yoxford Roundabout PEI

11.1. Introduction to PEI

11.1.1. **Volume 1 Chapter 16** sets out the details of a new roundabout in Yoxford which is required to support both the rail-led and road-led strategies. The proposed roundabout (refer to **Volume 1 Figure 16.1**) would replace the existing A12/B1122 ghost island junction in Yoxford.

11.1.2. The roundabout would be approximately 100m north of the existing junction and would be built on agricultural land to the east of the existing A12. The B1122 would be realigned to join the roundabout via a new section of road that starts north of "The Cottage" shown in **Volume 1 Figure 16.1**. The A12 approach roads leading into the roundabout would be 7.3m in width, with the B1122 approach road 6m wide. All three of the approaches would flare to create additional width at the roundabout give-way line.

11.1.3. The proposed roundabout is likely to have some effects on the environment during construction and operational phases. The new roundabout would be retained as part of the road infrastructure and there is no consideration of a removal and reinstatement phase. The principal likely significant adverse and beneficial effects are explained below.

11.1.4. This chapter presents each of the topics relevant to the site in turn, under the following sub-headings: (a) Baseline environment, (b) Environmental design and embedded mitigation, (c) Preliminary assessment of effects, (d) Additional mitigation and monitoring, (e) Preliminary assessment of residual effects and (f) Completing the assessment.

11.2. Landscape and visual

11.2.1. The figure for landscape and visual is presented in **Volume 3** as **Figure 11.2.1**.

a) Baseline environment

11.2.2. The surrounding land use within the vicinity is predominantly grazing land, parkland and arable farmland, with well-defined hedgerow field boundaries, often tree-lined, and interspersed with scattered woodlands and copses. The site itself is a combination of existing road infrastructure, roadside vegetation and land used for horse grazing, as well as a small area of private garden, with a total area of approximately 2.8 hectares (ha). Within the areas of horse grazing, field boundaries are generally post and wire fences.

11.2.3. The site boundaries largely follow the existing road layout, with boundaries to the south and west following existing roadside hedgerows/tree belts. The eastern boundary of the site is not currently defined on the ground and runs through the existing horse grazing fields. Existing roadside vegetation along the A12 falls within the site boundary. This would be removed in order to build the proposed roundabout.

11.2.4. The topography of the site is relatively flat but slopes gently down from south to north.

11.2.5. At a national level, the site and much of the study area are situated within National Character Area 82 (NCA82): South Coast and Heaths (Ref. 11.2.1). NCA82 shows characteristics of gently undulating farmland with areas of woodland and forest plantation in the surrounding area. To the west, the study area becomes NCA83: South Norfolk and High Suffolk Claylands (Ref. 11.2.2). NCA83 is a predominantly flat clay plateau incised by numerous small-scale wooded river valleys.

11.2.6. At a local level, the site is located in the 'rolling estate claylands' landscape character type, with 'Valley Meadows and Fens' landscape character type located immediately to the north as identified in the Suffolk County Landscape Character Assessment (Ref. 11.2.3) and shown in **Figure 11.2.1**. The rolling estate claylands' is a valley-side landscape of clay loams with parklands and fragmented woodland. The key characteristics are described in the Landscape Character Assessment as:

- *"Flat landscape of light loams and sandy soils;*
- *Rolling valley-side landscape;*
- *Medium clay and loamy soils;*
- *Organic pattern of fields;*
- *Occasional areas of more rational planned fields;*
- *Numerous landscape parks;*
- *Substantial villages;*
- *Fragmented woodland cover, both ancient and plantation; and*
- *Winding hedged and occasionally sunken lane".*

11.2.7. The 'Valley Meadows and Fens' landscape character type consists of flat, narrow, river valley bottoms, as shown in **Figure 11.2.1**. The site is less characteristic of this character type, but the key characteristics are described in the Landscape Character Assessment as:

- *"Flat, narrow, river valley bottoms;*
- *Deep peat or mixtures of peat and sandy deposits;*
- *Ancient meres within the valley bottoms & important fen sites;*
- *Small grassland fields, bounded by dykes running at right angles to the main river;*
- *Sparse scattering of small alder carr & plantation woodlands;*
- *Part of a wider estate type landscape;*
- *Largely unsettled, except for the occasional farmstead;*
- *Drier fields turned over to the production of arable crops;*
- *Cattle grazing now often peripheral to commercial agriculture; and*
- *Loss to scrub encroachment, tree planting and horse paddocks".*

11.2.8. The locations of different groups of people within the study area who may experience views of the proposed roundabout are shown in **Figure 11.2.1**. The key visual receptors within the study area include the following:

- the settlement of Yoxford;
- transport routes including the B1122 to the south and the A12 through the site;
- recreational routes include a footpath along Love Lane to the south; and
- dispersed farmsteads, with the closest residential properties being along the B1122 to the south-east and along the A12 to the north.

11.2.9. Visibility from many of these locations is likely to be limited due to a combination of existing roadside vegetation and existing buildings. In most cases, visibility is likely to be limited to within less than 250 metres (m), due to existing mature vegetation along roadsides and built development within Yoxford itself.

11.2.10. The Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB) is located outside of the study area, approximately 4.2 kilometres (km) to the east of the site.

11.2.11. The site is located within a Special Landscape Area (SLA), a locally designated landscape covering the valleys of both the River Minsmere and the River Yox.

b) Environmental design and embedded mitigation

11.2.12. Existing trees and hedgerows adjoining the site boundary would be retained where possible. The proposed roundabout would include some grassed areas, planting and grassed embankments.

c) Preliminary assessment of effects

i) Construction

11.2.13. During construction, there would be a localised change to the landscape character of the site and its immediate context. There would also be localised visual effects for users of the roads within the site. Given the localised extent of the effects and the very short-term duration of the construction period, effects are unlikely to be significant.

11.2.14. During construction, there would also be localised visual effects for local residents, users of the local roads and the footpath in close proximity to the site. However, due to the localised extent of the effects and the very short-term duration, effects are unlikely to be significant.

ii) Operation

11.2.15. During operation, there would be a very localised effect on the character of the landscape within the site, arising from the removal of existing vegetation along the edges of the A12 and a change from horse grazing to a new road alignment and associated infrastructure. Given the very localised effect of the proposals and the existing presence of road infrastructure within the site, these effects are unlikely to be significant.

11.2.16. From the majority of Yoxford, the proposed roundabout is unlikely to be visible due to the presence of Pins Wood on the eastern side of the village and vegetation along the western side of the existing A12, which would be retained. From properties immediately to the west of the site, along the existing A12, there may be some visibility of the proposed roundabout, but given the existing presence of road infrastructure within views from these properties, these effects are unlikely to be significant.

11.2.17. From isolated properties to the north and east of the site, existing vegetation around the properties or the orientation of the properties away from the site would mean that views of the proposed roundabout would be unlikely.

11.2.18. For users of roads in the surrounding area, there are likely to be views of the proposed roundabout from the A12 and B1122 as they approach and pass through the site. Beyond approximately 250m, visibility would be prevented by existing vegetation and buildings. Given that the proposals would be a relatively minor feature on these two routes and are not unusual features for road users to experience, there are unlikely to be any significant visual effects for users of the routes.

11.2.19. The proposed roundabout would only likely to be visible from the northern end of the public footpath along Love Lane to the south, due to the vegetated nature of the route. Given the existing presence of the A12 at the northern end of this route, this is unlikely to result in significant visual effects for users of the footpath.

11.2.20. There are unlikely to be views of the proposed roundabout from the Suffolk Coast and Heaths AONB. Given the very localised effect of the proposals and the existing presence of road infrastructure within the site, effects on the SLA are likely to be minimal. There are unlikely to be any significant effects on the special qualities of the designated landscapes or the purposes of their designation.

d) Additional mitigation and monitoring

11.2.21. No additional mitigation is proposed.

e) Preliminary assessment of residual effects

11.2.22. No significant residual effects are expected during the construction or operational phases of development.

f) Completing the assessment

11.2.23. The Environmental Statement (ES) would present a Landscape and Visual Impact Assessment (LVIA) underpinning the conclusions drawn above in relation to significant effects, updated where relevant to account for any design changes.

11.2.24. A study area, viewpoints and selected visualisations of the proposals would be agreed with the Local Planning Authority and key stakeholders. Viewpoints are likely to include the following locations:

- the eastern edge of Yoxford;
- adjacent to properties to the south-east, along the B1122;
- both the A12 and the B1122; and
- the northern end of the footpath along Love Lane to the south.

Table 11.2.1 Summary of effects for construction phase
Landscape and visual

Topic/receptor	Potential impact	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
Landscape character.	Changes to landscape character and landscape features.	Retention of established vegetation where possible. Introduction of appropriate landscape proposals.	Not significant.	None required.	Not significant.
Visual receptors.	Changes to views.	Retention of established vegetation where possible. Introduction of appropriate landscape proposals.	Not significant.	None required.	Not significant.

Table 11.2.2 Summary of effects for operational phase
Landscape and visual

Topic/receptor	Potential impact	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
Landscape character.	Changes to landscape character and landscape features.	Retention of established vegetation where possible. Introduction of appropriate landscape proposals.	Not significant.	None required.	Not significant.
Visual receptors.	Changes to views.	Retention of established vegetation where possible. Introduction of appropriate landscape proposals.	Not significant.	None required.	Not significant.

11.3. Terrestrial ecology and ornithology

11.3.1. The figure for terrestrial ecology and ornithology is presented in **Volume 3** as **Figure 11.3**.

a) Baseline environment

11.3.2. This baseline has been compiled following a detailed review of desk study information, including a data request from the Suffolk Biodiversity Information Service (SBIS), a review of aerial photographs and Ordnance Survey (OS) maps.

11.3.3. There are two European sites comprising Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites within 5km of Yoxford Junction (one site carries more than one designation). These are: Minsmere to Walberswick Heaths and Marshes SAC, Minsmere-Walberswick SPA and Ramsar site located approximately 4km east; and Dew's Ponds SAC located approximately 3km north.

11.3.4. There are two nationally designated sites (Sites of Special Scientific Interest (SSSI)) within 5km of Yoxford Junction, these being: Minsmere-Walberswick Heaths and Marshes SSSI located approximately 4km east; and Dew's Ponds SSSI located approximately 3km north.

11.3.5. There are four non-statutory designated sites within 2km of Yoxford Junction. The first, Roadside Nature Reserve 197, is located within the site boundary on the southern side of the B1122 (Middleton road) along the southern boundary of Yoxford Junction. It is designated on account of the presence of the Sandy Stilt Puffball fungus (*Battarraea phalloides*). The remaining sites are: Minsmere Valley Reckford Bridge to Beveriche Manor County Wildlife Site (CWS) located approximately 320m east; and Yoxford Wood CWS and Suffolk Coastal 212 CWS (which is also a Roadside Nature Reserve (RNR) Number 102) located between 1.5-2km north and south respectively.

11.3.6. The village of Yoxford is largely located to the west of the A12 and the surrounding area is characterised by arable farmland, blocks of woodland and parkland and floodplain grazing marsh associated with the surrounding watercourses.

11.3.7. The habitat within the site boundary comprises the A12 and B1122 roads and verges, and arable farmland within a field to the east of the A12 and north of Middleton Road. The western field boundary comprises a hedgerow with trees and the southern field boundary comprises scrub and trees. The north-western part of the site extends into an area of broadleaved woodland. The River Yox borders the northern site boundary, providing a hydrological connection downstream to the Minsmere Valley Reckford Bridge to Beveriche Manor CWS, and the Minsmere to Walberswick Heaths and Marshes SAC, SPA, Ramsar and SSSI site. A pond is present 20m from the eastern site boundary with another close by approximately 180m east of the site. Deciduous woodland, hedgerows, ponds and rivers are habitats of Principal Importance (Ref. 11.3.1, section 41).

11.3.8. A number of notable invertebrate species have been recorded in the wider area. Given that the habitat within the site boundary is predominantly arable farmland, the site is unlikely to be of particular importance to notable invertebrate species.

11.3.9. There are three records of great crested newts[1] (*Triturus cristatus*) from within the wider area. The closest of these is from a pond located approximately 700m south of the site. Ten ponds were identified from aerial photographs and OS maps that could support this species are present within 500m of the site, including the pond 20m to the east of the site boundary. The woodland, hedgerows and scrub habitat within the site provide suitable habitat for the terrestrial phase of this species, including potential hibernation sites, and aid connectivity to the wider landscape.

11.3.10. The majority of the site consists of suboptimal habitat for reptiles[2] although field and woodland margins could provide suitable foraging habitat for a small number of reptiles, and there are records of common reptile species in the wider area. Overall, the site is unlikely to be of particular importance to reptiles.

11.3.11. Based on SBIS records, breeding birds typical of agricultural habitats are present, including linnet (*Linaria cannabina*) and yellowhammer (*Emberiza citronella*), as well as ground-nesting birds such as skylark (*Alauda arvensis*). Barn owl[3] (*Tyto alba*) is also present in the wider area.

[1] Great crested newts are a European Protected Species (EPS), receiving protection under the Conservation of Habitats and Species Regulations (2017) (Ref. 11.3.2). They are also protected under the Wildlife and Countryside Act 1981 (Ref. 11.3.3) and are a species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[2] All UK species of reptiles are protected under the Wildlife and Countryside Act 1981, making it an offence to kill or injure these species. They are also species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[3] All wild birds, their eggs and nests are protected under Section 1 of the Wildlife and Countryside Act 1981. Barn owls are also listed on Schedule 1 of the Wildlife and Countryside Act 1981, which affords them extra protection against disturbance whilst nesting.

11.3.12. Soprano pipistrelle (*Pipistrellus pygmaeus*) and brown long-eared (*Plecotus auritus*)[4] bats have been recorded in the wider area. Linear features such as hedgerows within the site and the wider area could be of value to foraging and commuting bats, and any mature trees associated with the hedgerows, site boundary or the woodland within and adjacent to the site could be of value to roosting bats. No statutory designated sites within 10km cite bats as a designated interest feature.

11.3.13. There are records of otter[5] (*Lutra lutra*) from the River Yox which is located 50m from the northern boundary of the site. There are no records of water vole[6] (*Arvicola amphibious*) but they could also be present along the River Yox.

11.3.14. There are two records of badgers[7] (*Meles meles*) approximately 600m east of the site. Badgers are a common and widespread species in the area and could potentially forage within or adjacent to the site.

b) Environmental design and embedded mitigation

11.3.15. A summary of the measures that have been incorporated into the design of the proposed roundabout and that would protect the existing features of ecological interest are set out below.

i) Construction

- It is assumed that Roadside Nature Reserve 197 could be retained in situ within the site boundary but further design work would be required to confirm this.
- Valuable habitats such as hedgerows and woodland would be retained in situ where possible. Alternatively, any habitat loss would be kept to a minimum. Mitigation for the loss of any valuable habitats would be incorporated into the scheme design.
- The Construction Environmental Management Plan (CEMP) would define any ecological constraints and specify any measures required during enabling works and construction in relation to the presence of protected species and any required vegetation clearance works. It would specify the need for an Ecological Clerk of Works to undertake and oversee specific tasks.
- Temporary construction lighting would be minimised in order to minimise light-spill into adjacent habitats. This would reduce impacts on nocturnal species such as bats that may use nearby habitats for roosting or foraging.

ii) Operation

- The lighting scheme for the roundabout would comply with DMRB requirements and would also seek to minimise light-spill into adjacent habitats. This would minimise impacts on nocturnal species such as bats that may use nearby habitats for roosting or foraging

c) Preliminary assessment of effects

11.3.16. Significant effects on designated sites, plants and habitats, invertebrates, reptiles, breeding birds, water voles, otters and badgers are not anticipated, and they are not discussed further in this section of the PEI. A detailed impact assessment would be presented for these habitats and species within the ES and further details of the embedded mitigation to offset any significant effects would also be described.

11.3.17. Significant effects on great crested newts and bats are possible. A preliminary assessment of effects on these species is provided below.

i) Construction

11.3.18. Waterbodies within 500m of the site boundary could support breeding great crested newts. Whilst no ponds would be lost as a result of the proposals, some areas of suitable terrestrial habitat would be affected, potentially resulting in injury or mortality of great crested newts and loss of resting places. There is the potential for a significant adverse effect if the ponds and related terrestrial habitats are important for great crested newts.

11.3.19. Noise and lighting could potentially temporarily disturb bats that may roost within nearby mature trees or buildings or use the hedgerows within and surrounding the site for foraging and commuting; this impact is unlikely to be significant as bats are already exposed to existing levels of noise and light. In addition, if any trees with features suitable to support roosting bats require removal, then there

[4] All species of bat in the UK are EPSs, receiving protection under the Conservation of Habitats and Species Regulations (2017). They are also protected under the Wildlife and Countryside Act 1981. Several bat species, including soprano pipistrelle and brown long-eared bat are species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006). Barbastelle bats are also listed in the European Commission (EC) Habitats Directive (1992) (Ref. 11.3.4, Annex II), requiring the establishment of SACs to conserve this species.

[5] Otter are an EPS, receiving protection under the Conservation of Habitats and Species Regulations (2017). Otter are also protected under the Wildlife and Countryside Act 1981 and are a species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[6] Water vole is protected under Schedule 5 of the Wildlife and Countryside Act 1981 and is a species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006).

[7] Badgers are protected under the Protection of Badgers Act (1992) (Ref. 11.3.5).

is the potential for incidental mortality and loss of roost features. This could potentially be a significant adverse effect depending on the nature and status of any bat roost.

ii) Operation

11.3.20. No significant impacts to great crested newts are envisioned during operation. Noise and lighting could potentially disturb bats that may roost within nearby mature trees or buildings or use the hedgerows within and surrounding the site for foraging and commuting. This impact is unlikely to be significant.

d) Additional mitigation and monitoring

11.3.21. The assessment has identified a limited potential for significant effects on bats and great crested newts to occur, despite the embedded mitigation measures. Additional mitigation measures may therefore be required to minimise impacts so that significant effects are avoided. Furthermore, additional mitigation measures may also be required in relation to habitats and species for which a significant effect is not anticipated, but which are nonetheless legally protected, to ensure compliance with the legislation. Under the CEMP, pre-construction surveys would be required and may result in mitigation measures such as micro-siting of specific elements of the project and/or licences for protected species. Monitoring of mitigation measures may also be required to ensure its effectiveness. These measures would be presented in the ES, if relevant.

11.3.22. In the event that the non-statutory designated Roadside Nature Reserve 197 cannot be retained, depending on the extent of habitat loss, it may be appropriate to translocate the topsoil and fungi spores within this designated site in order to safeguard the designated interest feature, Sandy Stilt Puffball fungus.

e) Preliminary assessment of residual effects

11.3.23. At this stage significant residual effects are not envisaged.

f) Completing the assessment

11.3.24. To inform the development of appropriate mitigation measures and complete the ES, an extended Phase 1 habitat survey would be undertaken. The focus of the survey would be to identify any ecological constraints such as the presence of legally protected species, particularly bats and great crested newts.

11.3.25. Once the survey has been completed, the detailed ecological assessment for the ES would then be progressed, clarifying whether significant adverse effects are likely. Any embedded mitigation measures which would be required to mitigate these effects would be defined and incorporated.

11.3.26. New licensing policies were introduced by Natural England in 2016 and a district licensing approach is being rolled out nationally. Great crested newt mitigation and licensing requirements are therefore subject to change and the approach to mitigation would be reviewed in further detail at the ES stage.

Table 11.3.1 Summary of effects for construction phase

Terrestrial ecology and ornithology

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
European and nationally designated site: Minsmere to Walberswick Heaths and Marshes SAC, SPA, Ramsar and SSSI.	Pollutants entering the Minsmere river upstream of the designated site.	Appropriate surface water control and chemical management outlined in the CEMP.	Not significant.	None required.	Not significant.
Other European and nationally designated sites.	No direct or indirect impact pathway identified.	None required.	Not significant.	None required.	Not significant.
Non-statutory designated sites: RNR 197.	It is anticipated that the designated site can be retained within the development. Pollution from dust.	Potential retention of designated site in situ. Dust Management Plan and dust suppression measures in CEMP.	Not significant (if site can be retained). Significant adverse (if site cannot be retained).	Habitat/soil translocation in the event that this designated site cannot be retained.	Not significant.
Other non-statutory designated sites.	No direct or indirect impact pathway identified.	None required.	Not significant.	None required.	Not significant.
Deciduous woodland and hedgerows.	Habitat loss.	Mitigation for habitat loss incorporated into scheme design.	Not significant.	None required.	Not significant.
Watercourses	Potential pollution from surface water run-off and spillages.	Appropriate surface water control and chemical management outlined in the CEMP.	Not significant.	None required.	Not significant.
Great crested newts.	Habitat loss and incidental injury and mortality.	Measures for great crested newt mitigation outlined in CEMP.	Potential adverse significant effect.	Potential mitigation measures under Natural England licence.	Not significant.
Reptiles	Habitat loss and incidental mortality.	Measures for reptile mitigation outlined in CEMP.	Not significant.	None required.	Not significant.
Breeding birds.	Loss of habitat for nesting and foraging.	Measures for nesting birds and vegetation clearance outlined in the CEMP.	Not significant.	None required.	Not significant.

Table 11.3.1 Summary of effects for construction phase

Terrestrial ecology and ornithology

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
Bat assemblage.	Loss of roosting resource (trees).	Retention of majority of tree resource.	Potential adverse significant effect.	Potential mitigation measures under Natural England licence. Early provision of new roost resource (e.g. bat boxes).	Not significant.
	Noise and lighting disturbance causing fragmentation and displacement of resident bat populations.	Noise and lighting control measures set out in CEMP.	Not significant.	None required.	Not significant.
Otters and water voles.	Potential pollution from surface water run-off and spillages.	Appropriate surface water control and chemical management outlined in the CEMP.	Not significant.	Potential mitigation measures under Natural England licence.	Not significant.
Badgers	Loss and severance of habitat. Disturbance or damage to existing setts.	Measures to protect badgers from construction works detailed in CEMP.	Not significant.	Potential mitigation measures under Natural England licence.	Not significant.

Table 11.3.2 Summary of effects for operational phase

Terrestrial ecology and ornithology

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
European and nationally designated site: Minsmere to Walberswick Heaths and Marshes SAC, SPA, Ramsar and SSSI.	Pollutants entering the Minsmere river upstream of the designated sit.	Sustainable Urban Drainage System (SuDS).	Not significant.	None required.	Not significant.
Other European and nationally designated sites.	No direct or indirect impact pathway identified.	None required.	Not significant.	None required.	Not significant.
Non-statutory designated sites.	No direct or indirect impact pathway identified.	None required.	Not significant.	None required.	Not significant.
Deciduous woodland and hedgerows.	No direct or indirect impact pathway identified.	None required.	Not significant.	None required.	Not significant.
Watercourses	Potential pollution from surface water run-off and spillages.	SuDS	Not significant.	None required.	Not significant.
Great crested newts.	Significant effect unlikely.	None required.	Significant effect unlikely.	None required.	Significant effect unlikely.
Reptiles	Significant effect unlikely.	None required.	Significant effect unlikely.	None required.	Significant effect unlikely.
Breeding birds.	Significant effect unlikely.	None required.	Significant effect unlikely.	None required.	Significant effect unlikely.
Bat assemblage.	Impacts from noise and lighting.	None required.	Not significant.	None required.	Not significant.
Other mammals: otters, water vole and badgers.	Significant effect unlikely.	None required.	Significant effect unlikely.	None required.	Significant effect unlikely.

11.4. Amenity and recreation

11.4.1. The figure for amenity and recreation is presented in **Volume 3** as **Figure 11.4.1**

a) Baseline environment

11.4.2. Amenity and recreation resources comprise Public Rights of Way (PRoW) passing through the rural, predominantly arable agricultural landscape surrounding Yoxford, as shown in **Figure 11.4.1**. There are no PRoW running through the site boundary. Footpath E-584/020/0 runs from the site boundary at the B1122 Middleton Road, away from the site in a south-westerly direction. The footpath follows a lane enclosed by vegetation which limits views towards the site.

11.4.3. There are other recreational resources within the 1km study area but the proposed roundabout is unlikely to be perceptible from these and, if it is, it would be a minor change.

b) Environmental design and embedded mitigation

11.4.4. Existing trees and hedgerows adjoining the site boundary would be retained wherever possible. The proposed roundabout would include some grassed areas, planting and grassed embankments. Measures to minimise noise and changes to air quality would be implemented as described in **Noise and vibration, section 11.7** and **Air quality, section 11.8**.

c) Preliminary assessment of effects

11.4.5. Users of the northern end of footpath E-584/020/0 may experience some minor changes to views, air quality and noise due to the construction and operation of the proposed roundabout. These effects would not be significant.

d) Additional mitigation and monitoring

11.4.6. No additional mitigation is proposed.

e) Preliminary assessment of residual effects

11.4.7. No significant residual effects are expected for any phase of the development.

f) Completing the assessment

11.4.8. The ES would present a full amenity and recreation Impact Assessment underpinning the conclusions drawn above in relation to significant effects, updated where relevant to account for any design changes.

Table 11.4.1 Summary of effects for construction phase

Amenity and recreation

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
Users of amenity and recreation resources.	Changes to views, air quality and noise.	Retained hedges and planting (wherever possible). Measures to minimise noise and changes to air quality.	Not significant.	None	Not significant.

Table 11.4.2 Summary of effects for operational phase

Amenity and recreation

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
Users of amenity and recreation resources.	Changes to views, air quality and noise.	Retained hedges and planting (wherever possible). Measures to minimise noise and changes to air quality.	Not significant.	None	Not significant.

11.5. Terrestrial historic environment

11.5.1. The figure for terrestrial historic environment is presented in **Volume 3** as **Figure 11.5.1**.

a) Baseline environment

11.5.2. An archaeological desk based assessment (DBA) of the A12/B1122 roundabout site has been undertaken. This DBA considered existing records of archaeological features and investigations as well as historic mapping, aerial photography and documentary sources. Searches of Suffolk Historic Environment Record (HER), Historic England's Archives Monuments Information England (AMIE), and the National Heritage List for England were undertaken in April 2018, to ensure that the assessment included the most up to date information. A study area of 500m from the site boundary was agreed with Suffolk County Council Archaeological Service (SCCAS) for the DBA.

11.5.3. There is one designated heritage asset within the site – Yoxford Conservation Area extends into the eastern edge of the site boundary.

11.5.4. There are a further 26 listed buildings within the 500m study area (see **Table 11.5.3**). One of these is Grade I listed (Cockfield Hall LB 1030621); two are Grade II* listed and the remaining 23 are Grade II listed. These include residential and village buildings dating from the late-17th century (Old School Cottages (LB 1030626) to the early-19th century Wesleyan Methodist Chapel (LB 1030596).

11.5.5. There is one HER within the site (Yoxford settlement core, MSF25765), and a further 20 HER records are located within the study area. The AMIE notes 13 records within the study area. The HER and AMIE records comprise a variety of heritage features ranging from prehistoric flint artefacts to a Second World War (WWII) pillbox, which are discussed more fully in the site chronology section below.

11.5.6. Hedges along the southern edge of the site (where present), as well as that which divides the main field from the A12 at the western part of the site, follow boundaries shown on the Tithe mapping, which pre-dates the Inclosure Act 1845 (Ref. 11.5.1), and therefore should be considered important under the Hedgerow Regulations 1997 (Ref. 11.5.2). Hedgerows within the site could be considered important under the Hedgerow Regulations 1997. These are best considered as heritage assets of low significance for historic and aesthetic interest resulting from their contribution to historic landscape character.

11.5.7. The HER includes 10 records of archaeological investigations undertaken within the study area including DBAs, evaluations and archaeological monitoring of construction works.

i) Prehistoric to Iron Age

11.5.8. There are no records of archaeological material dating from the prehistoric to Iron Age periods within the site boundary. Flints were found within the study area during works to the bridge in Cockfield Hall Park (ESF20646), and an undated flint was found during monitoring within the study area (MSF31163). An Iron Age weaving comb (MSF2055) was found in fields to the north of the site during works at the sewage works in the mid-1960s.

11.5.9. The potential for further, as yet unknown remains dating to the prehistoric to Iron Age period is uncertain. Further archaeological investigation planned for the site would enable a greater understanding of the location, nature and significance of any remains.

ii) Romano-British

11.5.10. There is limited evidence for Roman activity within the study area. One chance find, a brooch, was found in fields towards the western part of the study area (MSF23395).

11.5.11. Desk-based research identified a suggestion that Yoxford may have been at the junction of three Roman roads close to the fording point of the River Yox. These comprise roads from Bayleham to Peasenhall and Pulham St Mary to Peasenhall, as well as a possible third road heading towards the supposed site of the small town of *Sitomagus*, for which locations at East Green, Knodishall and Dunwich have been proposed.

11.5.12. The presence of a Roman road would be of interest, although preservation of these features is generally limited and would be of restricted informative potential. Any associated remains could be of higher value depending on their nature and preservation.

11.5.13. Further archaeological investigation planned for the site would enable a greater understanding of the location, nature and significance of any Roman remains.

iii) Early-medieval and medieval

11.5.14. No finds dating to the early-medieval or medieval periods are known within the site boundary.

11.5.15. Yoxford Village (MSF25765) has its origins in the Late Saxon period, as an agricultural settlement, at a fording point over the river Yox, and is mentioned in the Doomsday book. It appears likely that the early-medieval settlement was focused on the church site, and it is thought likely that the fork north off the modern B1120 at Little Street represents an Anglo-Saxon and Norman route to the ford.

11.5.16. The location of the site beyond the eastern edge of the village core, suggests that there is a limited potential for further archaeological remains of these periods. This potential cannot, however, be ruled out and further investigation will allow for a better understanding of this potential.

iv) Post-medieval

11.5.17. The site appears to have remained outside the settlement core of Yoxford and the various areas of parkland that sprang up around it through the post-medieval period. Consequently, it is not anticipated that archaeological remains of these periods would be present on the site.

v) Modern disturbance

11.5.18. Cultivation during the 20th century is likely to have disturbed the upper layers of any buried archaeology. Repeated ploughing, particularly subsoil ploughing, can be expected to have disturbed near surface features, although more substantial negative features such as ditches and pits are likely to be relatively well-preserved. It is also possible for ploughing and natural processes to result in the development of colluvial deposits, which may preserve earlier features.

b) Environmental design and embedded mitigation

11.5.19. Change to setting arising from visibility of the proposed roundabout, and construction noise or changes to air quality, could give rise to loss of or harm to heritage significance.

11.5.20. Detailed design would be undertaken to minimise, as far as possible, perceptual change to setting and the character of the Yoxford Conservation area, wherever practicable. Detailed design would also seek to minimise perceptual change, for example, by retention of existing planting to the western side of the A12.

11.5.21. As part of the embedded mitigation, where practicable, surviving hedges would be retained and maintained, although hedges to the present A12 and B1120 would be largely removed, with any replacement planting respecting the new line of the A12.

c) Preliminary assessment of effects

i) Construction

11.5.22. Intrusive groundworks would take place across the site, including topsoil stripping and subsoil disturbance during the construction of the proposed road. Invasive works of this nature would adversely affect any surviving subsurface archaeological remains, reducing or removing their ability to be further interpreted, resulting in the loss of archaeological interest.

11.5.23. DBA has suggested the potential presence of previously unrecorded archaeological remains on the site. Any archaeological remains within the site would be substantially disturbed, if not removed entirely, by the proposed roundabout. This would give rise to a large magnitude of change which could be significant, in the absence of further mitigation.

11.5.24. Where embedded mitigation is in place, the change to the important hedgerows is considered to be medium, with a resulting minor effect, which would not be significant.

11.5.25. Construction activities could potentially affect the settings of designated heritage assets within and beyond the proposed route. An initial study has been undertaken to identify designated assets which have the potential to be affected by the proposed roundabout in accordance with Step 1 of the Historic England guidance (Good Practice Advice in Planning Note 3) (Ref. 11.5.3), and full assessment would be presented to accompany the application for development consent.

11.5.26. While most listed buildings are at least partially screened from the A12, buildings close to the proposed roundabout may experience some disturbance during construction, although change to setting would be short-term and temporary and is unlikely to give rise to significant effects.

11.5.27. The site boundary incorporates the eastern edge of Yoxford Conservation Area. The core of the conservation area lies within the village itself, and the A12 is already considered a busy road. Given the short-term nature of the construction works, proposed changes may represent a change to setting, but effects are unlikely to be significant. However, further consultation will be undertaken with the Suffolk Coastal District (SCDC) Council Conservation Officer to discuss the potential effects.

ii) Operation

11.5.28. In that any disturbance of archaeological heritage assets within the site would have occurred, and been effectively mitigated, during the construction of the proposed roundabout, no direct effects on heritage assets within the site are anticipated during the operation of the proposed roundabout.

11.5.29. Effects to the setting of Yoxford Conservation Area would arise as a result of the visibility of the proposed roundabout in views of and from the fringes of the Conservation Area. The existing A12 already provides a strong perceptual boundary to the Conservation Area and views of the roundabout would be largely screened from the core of the Conservation Area by existing buildings and planting. With appropriate design, it is not expected that the effect would be significant. However, further consultation will be undertaken with the SCDC Conservation Officer, to discuss the potential effects.

11.5.30. While most listed buildings are at least partially screened from the A12, buildings close to the proposed roundabout may experience changed views and noise levels and the effect of these changes on heritage significance would be considered. As these buildings are close to the existing A12 junction, it is unlikely that these changes would present sufficient change to give rise to a qualitative change to setting and, therefore, effects would not be significant.

d) Additional mitigation and monitoring

11.5.31. Mitigation would comprise the adoption of an agreed scheme of archaeological investigation to ensure that the archaeological interest of any significant deposits and features within the site could be appropriately investigated, recorded and disseminated. The exact nature of the investigation would be confirmed when the results of archaeological trial trenching are known.

11.5.32. Monitoring of the agreed scheme of archaeological investigation would be carried out by SCC during the implementation of the scheme.

e) Preliminary assessment of residual effects

11.5.33. The loss of archaeological interest through material disturbance within the site during construction could have a significant adverse effect. At present there is an absence of any evidence for past activity within the site, although field evaluation would enable a better understanding of any potential archaeological remains within the site. Should archaeological remains be present, and following the implementation of an agreed scheme of archaeological investigation the significance of the residual effect is not expected to be significant.

f) Completing the assessment

11.5.34. A full archaeological assessment of the proposals would be undertaken as part of the Environmental Impact Assessment (EIA) and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant direct effects, and would draw upon LVIA, noise, air quality and other assessments where appropriate.

11.5.35. This would include a settings assessment, which would be consulted on ahead of application with HE and SCDC's Conservation Officer. It would consider heritage assets where setting may potentially be subject to effects, their current setting, the potential change, and the magnitude of effect the proposed roundabout may have on their setting. Any mitigation required would also be consulted upon.

11.5.36. In advance of construction, field evaluation would be undertaken and this would include geophysical survey and trial trenching, the scope and extent of which would be agreed with SCCAS.

11.5.37. Once the intrusive archaeological investigation (trial trenching) is complete, an appropriate mitigation scheme for buried archaeological remains, if present, would be agreed with SCCAS

Table 11.5.1 Summary of effects for construction phase
Historic Environment

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
Previously unrecorded archaeological remains.	Disturbance or removal as a result of topsoil stripping and subsoil disturbance.	None	Significant	Agreed written scheme of archaeological investigation to ensure that the archaeological interest of any significant deposits and features could be appropriately investigated, recorded and disseminated.	Not significant.
Historic Hedgerows.	Loss due to construction activities / location of roundabout.	Retain where possible.	Not significant.	None required.	Not significant.
Yoxford Conservation Area.	Short-term, temporary impact on setting of eastern edge of Conservation Area due to disturbance during construction.	Standard code of construction practice measures to limit noise and air quality disturbance.	Unlikely to be significant.	None required.	Unlikely to be significant.
Listed buildings within Yoxford close to the proposed roundabout location.	Short-term, temporary impact on setting due to disturbance during construction.	Standard code of construction practice measures to limit noise and air quality disturbance.	Unlikely to be significant.	None required.	Unlikely to be significant.

Table 11.5.2 Summary of effects for operational phase
Historic Environment

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
Yoxford Conservation Area.	Impact on setting of eastern edge as a result of the visibility of the proposed roundabout in views of and from the fringes of the Conservation Area.	Design and screening.	Unlikely to be significant.	None	Not significant Unlikely to be significant.
Listed buildings within Yoxford close to the proposed roundabout location.	Impact on setting due to change in views and noise levels.	Design and screening.	Unlikely to be significant.	None	Not significant Unlikely to be significant.

Table 11.5.3 Designated heritage assets within A12/B1122 roundabout study area

Historic England List Entry	Name	Grade	Easting	Northing
–	Yoxford Conservation Area	–	639554	268949
1030621	Cockfield Hall	I	639596	269133
1030591	The Lodge	II	639507	269002
1030594	Vine Cottage	II	639356	268978
1030596	Methodist Chapel	II	639562	268978
1030622	Dovecote Cockfield Hall	II	639626	268952
1030623	Gateway 20m west-north-west of Cockfield Hall Gatehouse (including adjoining walling)	II	639629	269153
1030625	The Limes	II	639719	268778
1030626	Old School Cottages	II	639528	268548
1030627	The Gables	II	640022	269084
1030628	Old Bakery	II	639491	268982
1030629	Signpost 20m north east of St Peters Church Tower	II	639436	269009
1030633	Pine Tree Cottages	II	639611	268898
1200577	Coach House and Barn Cockfield Hall	II	639644	269197
1200596	Walling to north and west of Cockfield Hall Gatehouse	II	639594	269168
1200607	Gateway immediately north-west of Coach House and Barn, Cockfield Hall (including adjoining walling)	II	639619	269216
1200636	Satis House	II	639806	268771
1200647	Cockfield Hall Lodge	II	639973	269088
1200652	London House	II	639499	268968
1200712	Manor House (east side)	II	639486	269020
1200791	Rookery Cottages	II	640133	268564
1377235	Gateway immediately south-east of Coach House and Barn, Cockfield Hall (including adjoining L shaped section of walling to south-east)	II	639656	269181
1377237	White Lodge and The White House	II	639768	268740
1377257	Manor House (west side)	II	639469	269020
1377274	Dairy Range Cockfield Hall	II	639606	269200
1200659	Church of St Peter	II*	639434	268982
1300688	The Gatehouse Cockfield Hall	II*	639610	269152

11.6. Soils and agriculture

11.6.1. The figures for soils and agriculture are presented in **Volume 3** as **Figures 11.6.1** to **11.6.3**.

a) Baseline environment

11.6.2. The site is underlain by an area mapped as the Crag Group (quaternary sand), which in places is overlain with Polymict deposits comprising of sand, silt, clay and gravel (Ref. 11.6.1).

11.6.3. The soils on the site are shown in **Figure 11.6.1** (Ref. 11.6.2). The soils are described as freely draining slightly acid but base-rich soils. These belong to the Melford Soil Association (representing a group of soil types which are typically found occurring together in a landscape). The main land use on these soils is described as being cereals, sugar beet and other arable crops.

11.6.4. Published Agricultural Land Classification (ALC) maps (Ref. 11.6.3) (See **Figure 11.6.2**) show the land within the scheme boundary to comprise a mix of Grade 3 land. Under the ALC system land is graded between Grade 1 and 5, with Grade 3 subdivided into 3a and 3b. A total of 2.8ha can be classified as undifferentiated Grade 3 land (based on available provisional ALC maps).

11.6.5. There is no published detailed ALC mapping available for the land within the scheme boundary (**Figure 11.6.2**). Based on the provisional mapping, the proportion of land for the given grade would be as follows (noting that the full assessment would be based on detailed survey data).

11.6.6. Land within the site boundary, from aerial photographs, appears to be predominantly pasture with woodland. To the south of Middleton Road, lies an area of open woodland, which in part includes an area under an England Woodland Grant Scheme (**Figure 11.6.3**). Land immediately to the north-east of the scheme boundary is under Entry Level plus Higher Level Stewardship.

b) Environmental design and embedded mitigation

11.6.7. A summary of the measures that have been incorporated into the design of the proposed roundabout and that would protect the existing features of soil and agricultural interest is set out below.

i) Construction

11.6.8. The sustainable re-use of the soil resource would be undertaken in line with the Construction Code of Practice for the Sustainable Use of Soil on Construction Sites (Ref. 11.6.4). This would be achieved by the development of a Soil Management Plan (SMP) identifying the soils present, proposed storage locations and handling methods and how the resource would be re-used. The SMP would form part of the Construction Environmental Management Plan (CEMP). Measures which would be implemented include (but are not limited to):

- completion of a Soil Resources Survey and incorporate results into a SMP;
- link the SMP to the Site Waste Management Plan (SWMP);
- ensure soils are stripped and handled in the driest condition possible;
- confine vehicle movements to defined haul routes until all the soil resource has been stripped;
- protect stockpiles from erosion and tracking over; and
- ensure physical condition of the entire replaced soil profile is sufficient for the post-construction use.

11.6.9. Surface water/agricultural drains damaged during construction works would be reconnected to suitable new outfalls to ensure continued adequate drainage of the adjacent land.

11.6.10. All soils would be stored away from watercourses (or potential pathways to watercourses) and any potentially contaminated soil would be stored on an impermeable surface and covered to reduce leachate generation and potential migration to surface waters.

11.6.11. Industry standard measures would be put in place to control pollution, including from fuel or chemical stores, silt-laden run-off or dust.

11.6.12. Following completion of construction operations all agricultural land taken temporarily (such as for a compound) would be fully reinstated as near as practically possible to its former condition. Topsoil would be prepared and seeded using an appropriate seed mix or returned immediately to cultivation depending on the time of year.

11.6.13. A considerate construction approach would be used to minimise potential impacts on the remainder of the landholding and on neighbouring landholdings during the construction phase. Toolbox talks would be used to inform all those working on the site of the requirements for soil handling and minimisation of disturbance to agricultural activities.

11.6.14. All fencing around the proposed roundabout would be sufficient to resist damage by livestock and will be regularly checked and maintained in a suitable condition. Any damage to boundary fencing would be repaired immediately.

11.6.15. Measures contained in relevant Department for Environment, Food and Rural Affairs (Defra) and Environment Agency best practice guidance on the control and removal of invasive weed species would be implemented where appropriate.

11.6.16. Works would cease, and the Animal Health Regional Office would be advised, should animal bones be discovered which indicate a potential burial site.

11.6.17. All movement of plant and vehicles between fields would cease in the event of a disease outbreak and official Defra advice would be followed to minimise the biosecurity risk associated with the continuation of works.

11.6.18. In relation to temporary and permanent land take requirements EDF Energy would liaise with landowners to understand and where possible address their concerns.

ii) Operation

11.6.19. The measures described for the construction phase would be maintained throughout the operational phase.

c) Preliminary assessment of effects

11.6.20. The potential for significant effects on soils and agriculture is discussed in this section. The assessment of significance is based on the embedded mitigation measures outlined above being in place.

i) Construction

11.6.21. The proposals for this site would result in the permanent loss of 2.8ha of land from primary agricultural productivity. Based on currently available information this could comprise some best and most versatile land (likely to be Grade 3a).

11.6.22. There would also be an impact on the agricultural enterprise because of the loss of a proportion of the productive land. This would be assessed on a case by case basis as required.

11.6.23. On the assumption that landowners' concerns are addressed, through appropriate mitigation, this preliminary environmental assessment considers that significant effects on the agricultural enterprise are unlikely to occur and so are not considered further.

ii) Operation

11.6.24. There would be no additional operation phase effects on the soil resource or agricultural enterprise.

d) Additional mitigation and monitoring

11.6.25. There are no mitigation measures available for the loss of best and most versatile land.

e) Preliminary assessment of residual effects

11.6.26. Taking into account the embedded mitigation measures and the limited potential extent of best and most versatile land loss, there no significant effects during the construction and operational phases.

f) Completing the assessment

11.6.27. Once the proposals for the development as a whole are finalised, a full assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects. An ALC survey would be undertaken across the site to fully inform the assessment impacts. In addition, landowner interviews would be undertaken.

Table 11.6.1 Summary of effects for construction phase

Soils and agriculture

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
Agricultural land.	Loss of up to 2.75ha of which at least a proportion is likely to be best and most versatile land.	There are no mitigation measures available for the loss of agricultural land.	Not significant.	There are no additional mitigation measures available.	Not significant.
Agricultural businesses.	Temporary impact due to the loss of a proportion of the productive land.	EDF Energy engage with all affected landowners.	Not significant.	No adverse significant effects identified; additional mitigation measures are therefore not required.	Not significant.

Table 11.6.2 Summary of effects for operational phase

Soils and agriculture

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
Agricultural land.	The impacts will be the same as identified in the construction phase.				
Agricultural businesses.	There are no impacts identified during the operational phase.				

11.7. Noise and vibration

11.7.1. The figure for noise and vibration is presented in **Volume 3** as **Figure 11.7.1**.

a) Baseline environment

11.7.2. Baseline survey work has been undertaken at three locations in Yoxford. One of these locations is adjacent to the existing A12/B1122 junction where ambient noise at a distance of 2m from the road was measured to be 72dB (which is typical of noise levels expected at this distance from a road of this sort). The other two locations in Yoxford are not directly relevant in this context but have been used to inform the baseline for the wider project. An initial review of construction noise and vibration impacts can be made without reference to detailed, existing baseline values since the levels at which noise and vibration would be considered to be significant depends on absolute values rather than existing values. Operational noise impacts would be assessed against modelled noise values, based on traffic flow data and thus the baseline is obtained from this rather than measured values.

11.7.3. Noise and vibration impacts have been considered up to 100m from the site boundary of the proposed roundabout. **Figure 11.7.1**. shows the extent of the study area with receptors. Assessment of other potential receptors such as ecological receptors, listed buildings and PRoWs is presented in the relevant sections.

b) Environmental design and embedded mitigation

i) Construction

11.7.4. The standard of good practice outlined in 'British Standard BS5228-1 Noise: 2009 + A1 2014 – Code of Practice for noise and vibration control at open construction sites' (Ref. 11.7.1), would be followed. Embedded mitigation for the control of noise and vibration could include, but not be restricted to the following measures:

- selection of quiet plant and techniques in accordance with good practice in BS5228 for all construction, demolition and earth moving activities;
- switching off equipment when not required;
- use of reversing alarms that ensure proper warning whilst minimising noise impacts off-site; and
- provision of training and instruction to construction site staff on methods and techniques of working to minimise off-site noise and vibration impacts.

11.7.5. BS 5228-2, gives detailed advice on standard good construction practice for minimising impacts from construction vibration. It is expected it would be a requirement of the contractors to adhere to this guidance, which would be set out in the Construction Environmental Management Plan and be a requirement of the contractors to adhere to this guidance.

11.7.6. EDF Energy would also have a system for the receipt and recording of any noise or vibration complaints from occupiers of noise sensitive receptors, and procedures for investigating and acting appropriately as necessary upon those complaints.

ii) Operation

11.7.7. No embedded mitigation is proposed for the operational phase. Options for reduction of noise may be limited due to constraints imposed by highway safety and space as well as other environmental constraints.

c) Preliminary assessment of effects

11.7.8. Noise and vibration levels have been predicted by calculation and modelling. A "significant" effect has been identified where levels are predicted to exceed a specified threshold value. Appropriate threshold levels are based on various standards and a relevant guidance and depend on the type of source; the sensitivity of the receptors; the time of day when it might occur; and, in some situations, on the existing noise levels in the area.

i) Construction

11.7.9. A detailed analysis of noise and vibration impacts has not yet been carried out, but an initial overview of likely working techniques has enabled some initial high level conclusions to be drawn. These are described below.

11.7.10. Within the study area, noise from construction activity has the potential to have a significant effect at the dwellings listed in **Table 11.7.1**.

11.7.11. A detailed analysis of vibration from construction has yet to be carried out. It is possible that a significant effect might occur during breaking out at White House. Such effects would be short-term only. Further work is required to consider this in detail.

Table 11.7.1 List of receptors likely to experience a significant noise effect from construction of Yoxford Roundabout

Location code	Location name
1	Woodland Cottages
2	Satis House Hotel
3	Satis Coach House
4	White House
5	San Souci
6	Pinn's Piece
7	Rookery Lodge
8	The Cottage
9	Sunnypatch
10	The Limes
11	Tinkers
12	Holly House
13	Medway
14	The Old Barn
15	Rookery Cottages

11.7.12. Noise and vibration levels at other receptors within the study area during construction are unlikely to have a significant effect.

ii) Operation

11.7.13. It is unlikely there would be any significant adverse noise or vibration effects arising from the operation of the A12/B1122 Roundabout since the road traffic flow and distances between noise sources and noise sensitive receptors would not be changed to the degree that it would result in a significant change in level.

d) Additional mitigation and monitoring

i) Construction

11.7.14. The noise from the proposed compound area could be reduced through screening and layout design. It is likely that, with mitigation, to a height of approximately 3m between the compound and the closest receptor, noise levels would be reduced to a level which would not be significant.

11.7.15. Some mitigation may be possible using portable acoustic panels adjacent to the receptors listed in **Table 11.7.1**, although the reduction in noise level possible would depend on the working methods and constraints for screening design.

11.7.16. Further assessment of construction methods and consideration of the site layout will be undertaken to confirm mitigation requirements.

ii) Operation

11.7.17. No additional noise and vibration mitigation would be required for the operational phase.

iii) Monitoring

11.7.18. Routine monitoring would be carried out to a scheme to be agreed with local authorities. Provision would be made as necessary for monitoring of noise and vibration levels in the event of complaints being received from occupiers of noise sensitive receptors, or on request of the local authorities.

e) Preliminary assessment of residual effects

i) Construction

11.7.19. With mitigation in place, it is probable that some significant, short-term effects from noise (during the closest noise producing activities) would remain at the premises listed in **Table 11.7.1**. It is possible that medium term impacts (which would occur for the remainder of the construction phase) would be below significant for some of these receptors, but further work is needed to determine whether this would be the case.

11.7.20. It is possible that a significant, short-term effect might remain during breaking out at White House.

ii) Operation

11.7.21. There would be no residual noise or vibration effects.

f) Completing the assessment

11.7.22. Further assessment of impacts would be needed, including further consideration of the construction methodology, local topographical features and layouts.

The ES would present a full noise and vibration assessment and would consider any new information such as amended design or construction methodologies which might be relevant, although it is anticipated that the assessment would confirm the preliminary conclusions drawn above.

Table 11.7.2 Summary of effects for construction phase

Noise and vibration

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
All receptors listed in **Figure 11.7.1**.	Noise from construction works.	Selection of plant and methodology in accordance with good practice.	Significant noise effect likely.	Screening	Short-term significant noise effect probable, medium term impact may be below significant for some of these receptors.
White House, Yoxford.	Vibration from construction works.	Selection of plant and methodology in accordance with good practice.	Potentially significant effect.	Not yet known.	Potentially significant.
All other receptors within the study area.	Noise and vibration from construction activity.	Selection of plant and methodology in accordance with good practice.	Not significant.	None	Not significant.

Table 11.7.3 Summary of effects for operational phase

Noise and vibration

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
All receptors.	Noise and vibration from operational phase.	None	No significant noise or vibration impact.	None	Not significant.

11.8. Air quality

a) Baseline environment

11.8.1. The closest human receptors to the proposed roundabout are located around the junction of the B1122 and the A12, namely Rookery Lodge, Rookery Cottages, Pinn's Piece, any permanent residences on the grounds of Satis House Hotel, Woodland Cottages, Sans Souci and White Lodge.

11.8.2. There are no sites of nature conservation interest (i.e. international, European and nationally designated sites of ecological interest) within 350m of the proposed roundabout site or routes used by construction traffic, and therefore no sites are included in the construction phase air quality assessment. The nearest site designation is Minsmere-Walberswick SPA/SSSI, but at approximately 3.8km away, it is unlikely this would be affected by the proposed roundabout, so would be scoped out of consideration in the air quality assessment.

11.8.3. SCDC has declared two Air Quality Management Areas (AQMAs) within its boundary (Ref. 11.8.1) due to elevated monitored concentrations of ambient Nitrogen Dioxide (NO2), the nearest of which is approximately 9.5km from the site, along the A12 at Stratford St. Andrew. A third AQMA, at Dooley Inn, was revoked in 2016.

11.8.4. The nearest monitoring site (for a pollutant relevant to the assessment) is approximately 5.8km south in the form of a single NO_2 diffusion tube on Church Street, Saxmundham (Ref. 11.8.2), which in 2016 (the most recently reported year) reported a bias-adjusted concentration of 32µg/m^3. This concentration is below the annual mean air quality strategy objective of 40µg/m^3 (Ref. 11.8.3). As NO_2 concentrations are generally more elevated in urban areas, concentrations are likely to be slightly lower than this.

11.8.5. Background concentrations of NO_2 and Particulate Matter of a diameter of 10 microns or below (PM_{10}) in 2018 at the proposed development were 7.5µg/m^3 and 12.9µg/m^3 for NO_2 and PM_{10} respectively (Ref. 11.8.4); both are considerably below statutory objectives (Ref. 11.8.5, Ref. 11.8.6).

11.8.6. Dust levels are related to the action of wind on exposed soils and climatic conditions year to year, and existing levels are assumed to be low given the arable nature of the existing land use for the new roundabout.

11.8.7. Air quality is predicted to improve before 2027, because it is anticipated that improvements in vehicular emission rates and background concentrations would offset a general trend for an increase in vehicle numbers. Lower concentrations of road traffic-related pollutants may therefore be expected by the time the proposed roundabout is commenced. For example, NO_2 and PM_{10} 2027 background concentrations for the equivalent grid square are predicted at 5.7µg/m^3 and 12.5µg/m^3 respectively, a reduction in both pollutants.

11.8.8. No notable changes are expected in land use in the surrounding area and it is expected that rates of dust deposition would likely be similar to current levels.

b) Environmental design and embedded mitigation

i) Construction

11.8.9. The following mitigation measures have been embedded into the construction of the proposed roundabout:

- site access located as far as practicable, and preferably at least 10m, from receptors;
- any potential use of concrete batching plant located as far as practicable from receptors; and
- mobile crushing & screening plant located as far as practicable from receptors.

11.8.10. Air quality impacts arising from the construction phase would be managed through a range of control measures detailed in a CEMP, supplemented by the measures appropriate to the level of risk designated to the proposed roundabout under Institute of Air Quality Management (IAQM) Guidance (Ref. 11.8.7).

ii) Operation

11.8.11. The following mitigation measures have been embedded into the operation of the proposed roundabout:

- maintain Sizewell C construction vehicles using roundabout to a high standard so as to avoid excess pollution or possibility of breakdowns; and
- optimise traffic flows related to the main development site, in such a manner that the impact on the local road network at peak times is minimised.

c) Preliminary assessment of effects

i) Construction

11.8.12. The potential impacts associated with the construction of the proposed roundabout include fugitive emissions of dust, emissions from non-road mobile machinery (NRMM) on the site, emissions from Heavy Goods Vehicles (HGVs) accessing the site and emissions from vehicles carrying workers to and from the site. However, given that the location is relatively remote from most receptors and the embedded mitigation measures described above, the adverse effects are likely to be negligible and would therefore not be significant for any of the proposed construction activities at the site.

11.8.13. The principal risk is anticipated to be related to earthworks, as this phase of construction can typically require a high volume of material to be moved. A high level of activity could potentially place the dust emissions category as 'Medium' by IAQM classification, with the likelihood of a 'Medium' risk based on the number and sensitivity of local receptors. Each risk category has the potential to lead to proportional adverse, albeit temporary, impacts which have the potential to be significant without mitigation.

11.8.14. However, assuming all mitigation measures are effectively implemented and monitored through an effective CEMP, at the level recommended by the dust risk assessment, no significant dust effects resulting from demolition and construction activities are anticipated.

11.8.15. It is expected that the number of Heavy Duty Vehicle (HDV)[8] movements required to develop the site will not exceed the IAQM screening threshold (Ref. 11.8.8) of more than 100 Annual Average Daily Traffic required for a detailed dispersion modelling assessment and therefore it is unlikely there would be a significant air quality effect.

ii) Operation

11.8.16. There is potential for increases in pollutant concentrations at receptors located in the vicinity of the A12/B1122 roundabout during operation, contributed to by Sizewell C construction vehicles using the roundabout, particularly at receptors outlined in **paragraph 11.8.1** of this chapter.

11.8.17. The principal benefit of the proposed roundabout is that by improvements to the junction, there would be reduced idling time for vehicles, thereby reducing emissions.

11.8.18. Accordingly, IAQM guidance has been used to determine the necessity for an Air Quality Impact Assessment, and it is expected that the proposed roundabout would require a detailed assessment, given it meets a number of IAQM criteria, including the introduction/realignment of a junction. The purpose of the proposed roundabout is to increase capacity, and thereby alleviate congestion at this junction. This, in conjunction with the low baseline concentrations across the study area, indicates that there would unlikely be significant air quality impacts at receptors during operation.

11.8.19. There are not anticipated to be any impacts on AQMAs from the proposed roundabout.

d) Additional mitigation and monitoring

11.8.20. No significant adverse effects are predicted for any phase of development and no additional mitigation measures are therefore proposed.

e) Preliminary assessment of residual effects

11.8.21. No significant adverse residual effects are predicted during the construction or operational phases. It is likely that significant beneficial effects may arise from the proposed roundabout with reduced congestion arising from the junction improvements.

f) Completing the assessment

11.8.22. Once the proposals are finalised, the potential air quality effects of the proposed roundabout would be re-evaluated to confirm whether the preliminary conclusions presented above are applicable. The ES would present the full assessment considered necessary for the Proposed Development, underpinning the conclusions drawn in relation to the absence of significant adverse effects, and the presence of significant beneficial effects.

[8] HDVs include buses >3.5 tonnes in weight

Table 11.8.1 Summary of effects for construction phase

Air quality

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
Construction Dust					
Human	Potential generation of nuisance dust.	As recommended in CEMP and appropriate to level of risk identified by IAQM criteria.	Considered likely to be 'Medium' risk, but not a significant effect, provided CEMP mitigation measures are adhered to.	None	Not significant.
Vehicle/NRMM Emissions					
Human	Potential increase in emissions.	As recommended in CEMP.	Unlikely to meet IAQM screening criteria requiring assessment, therefore not significant.	None	Not significant.

Table 11.8.2 Summary of effects for operational phase

Topic/receptor	Impacts	Environmental design and embedded mitigation	Assesment of effects	Additional mitigation	Residual efects
Vehicle Emissions					
Human	Emissions at receptors.	Maintaining vehicles to high standard, avoid peak time travel and reducing idling time.	Unlikely to have significant adverse effects, likely to have significant beneficial effects.	None	Significant beneficial.

11.9. Geology and land quality

a) Baseline environment

i) Geology

11.9.1. The following provides a summary of the geology and geological characteristics within the site and site vicinity:

- made ground: potentially present, related to former railway/road construction and farmers' tips/pesticide soakaways;
- superficial deposits: the majority of site has no recorded superficial deposits. The northern section of the site is underlain with the Head Formation;
- bedrock: the Crag Group;
- important geological sites: none present;
- identified geological hazards: none present;
- mining, quarrying and natural cavities: none present;
- ground stability hazards: none present; and
- unexploded ordnance (UXO) risks: low risk.

11.9.2. Exploratory hole logs were identified in three areas within 500m of the site. The borehole logs generally correspond with the mapped geology. Groundwater was identified at 4.4m below ground level (m bgl) approximately 10m to the north-east of the site.

ii) Hydrology and hydrogeology

11.9.3. The following provides a summary of the hydrological and hydrogeological characteristics within the site and site vicinity:

- surface water features: pond located 250m north-east of site. The Minsmere "New Cut" river (and associated drains) and two surface water bodies related to the Rookery Park and Yoxford Sewage works located 50m north of the site;
- superficial aquifer: the Head Formation is classified as a Secondary (Undifferentiated) Aquifer;
- bedrock aquifer: the Crag Group is classified as a Principal Aquifer;
- groundwater vulnerability: the site contains soils of both medium and high leaching potential;
- groundwater/surface water abstractions: five groundwater abstractions are recorded within 500m of site, all related to 'General Farming/Agricultural' uses;
- groundwater/surface water discharge consents: none present;
- pollution incidents: two minor pollution incidents within 250m of the site involving spillages/leakages of oils into adjacent rivers and a significant incident involving an unknown pollutant into the River Yox approximately 420m to the west of the site; and
- flood risks: very low risk.

iii) Site history

11.9.4. The site currently supports agricultural land with Main Road (A12) and Middleton Road (B1122) in their current positions and this land use extends back to the 19th century at least. The areas surrounding the site have historically comprised Yoxford Village (including a sewage works) to the east, Rookery Park (including a former dam and septic tank) to the south and open fields including 'Piggeries' to the north and east.

iv) Landfills and waste management sites

11.9.5. There are no historical or currently authorised landfills or waste management sites located within 500m of the site.

v) Previous investigations

11.9.6. There have been no previous ground investigations undertaken at the site.

vi) Key hazards

11.9.7. Key hazards present within the site vicinity include the following:

- made ground (on-site and off-site) associated with the construction and operation of the A12 and B1122;
- Yoxford Sewage Works approximately 70m north-east of the site;
- historic septic tank 200m south of the site; and
- farm land on-site and in site vicinity including 'Piggeries'.

vii) Summary of preliminary conceptual site model

11.9.8. A summary of potential contamination sources, pathways and receptors identified within the Preliminary Conceptual Site Model is provided in **Table 11.9.1**.

Table 11.9.1 Potential sources of contamination

Potential source of contamination	Potential contamination	Approximate location
Made ground associated with construction of roads including A12 and B1122 as well as activities associated with their operation.	Fuels and oils attributed to spills from vehicles on the roads included within the site boundary, plus exhaust particulates. A range of inorganic and organic contaminants including the potential for asbestos.	On-site.
Farmland within site boundary. Potential for unmapped farmers tips.	Contamination risk from herbicides, pesticides, silage, effluent, and fuel oils. Risk of inorganic and organic contamination including metals, hydrocarbons, PCBs, and asbestos.	
Yoxford Sewage Works (approximately 70m north of the site). Historic Septic Tank 200m south of site).	Metals, organic contaminants including biological contaminants.	Off-site.
Farms including Piggeries around the site boundaries. Potential for unmapped farmers' tips/soakaways.	Contamination risk from herbicides, pesticides, silage effluent, and fuel oil. Risk of inorganic and organic contamination.	
Made ground associated with construction of roads including A12 and B1122 as well as activities associated with their operation (further to those encountered on-site).	Fuels and oils attributed to spills from vehicles on the roads included within the site boundary, plus exhaust particulates. A range of inorganic and organic contaminants including the potential for asbestos.	

11.9.9. Potential receptors and pathways as summarised in **Table 11.9.2** comprise:

Table 11.9.2 Potential receptors and pathways

Receptor Group	Receptor	Principal Contaminant Migration pathways
Human Health (on-site).	Pedestrians and road users using existing and future roads, roundabout, footpaths and fields within the site.	Dermal contact with and/or ingestion of contaminants in soils, soil-derived dusts and water. Inhalation of soil derived dust, fibres and gas/vapours.
	Agricultural workers.	
	Future construction/maintenance workers.	
Human Health (off-site).	Occupants of nearby residential and commercial properties.	
	Pedestrians accessing surrounding roads and footpaths.	
	Agricultural workers.	
Controlled Waters: Groundwater (on-site and off-site).	Groundwater in Principal Bedrock Aquifer; and Secondary Undifferentiated Superficial Aquifer.	Leaching of contaminants in soil to groundwater in underlying aquifer. Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers. Discharge of contaminants entrained in surface water run-off followed by overland flow and discharge
Controlled Waters: Surface Waters (off-site).	Minsmere "New Cut" river (and associated drains) and two surface water features.	
Property (on-site and off- site).	Existing on-site services and structures on and off-site. Proposed on-site services and structures.	Direct contact of contaminants in soil and/or groundwater with existing and proposed structures and buried services. Migration of contaminated groundwater, ground gas and/ or vapours along strata and preferential pathways such as service routes or differentially permeable strata.
	Crops and livestock.	Direct contact, ingestion, inhalation and uptake of soil and water contamination by crops and/or livestock. Migration of contaminated waters/dust/fibres and subsequent uptake by crops or ingestion/inhalation/dermal contact by livestock.

a) Environmental design and embedded mitigation

i) Construction

11.9.10. A summary of the measures that would be incorporated into the design of the proposed roundabout and that would protect land quality during construction is set out below:

- The Construction Environmental Management Plan (CEMP) would specify measures required during enabling works and construction including the following:
  - minimising the area and duration of soil exposure and timely reinstatement of vegetation or hardstanding to prevent soil erosion and reduce temporary effects on soil compaction;
  - stockpile management (such as water spraying and avoiding over stockpiling to reduce compaction of soil and loss of integrity) to prevent windblown dust and surface water run-off;
  - implementation of appropriate dust suppression measures to prevent migration of contaminated dust;
  - implementation of working methods during construction to ensure that there is no surface water run-off from the works or any stockpiles into adjacent surface watercourses/leaching into underlying groundwater in accordance with best practice;
  - implementation of appropriate pollution incident control e.g. plant drip trays and spill kits;
  - implementation of appropriate and safe storage of fuel, oils and equipment during construction;
  - implementation of an appropriate Materials Management Plan (MMP) to document how the excavated materials would be dealt with and a verification plan to record the placement of materials at the site; and
  - implementation of a SWMP.
- Remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) would be undertaken if further investigation and risk assessments deem necessary.
- Design of the roundabout and the selection of construction materials would be in accordance with good practice. The design would be required to take into account the ground conditions including the potential for ground aggressivity.

ii) Operation

11.9.11. The proposed roundabout would be operated in accordance with the relevant regulations and good practice to protect land quality.

c) Preliminary assessment of effects

i) Construction

11.9.12. The construction works would potentially introduce new sources of contamination and disturb and mobilise existing sources of contamination through excavation and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off and ground gas migration pathways. With the embedded mitigation measures, including ground investigation and remediation where required, construction activities should not increase the contamination risks presented at the site and an overall minor beneficial effect is predicted. These effects would not be significant.

11.9.13. A preliminary assessment of the effects during the construction phase are summarised in **Table 11.9.3**.

Table 11.9.3 Construction phase effects for the proposed development

Receptor	Value/Sensitivity	Baseline risk	Construction risk	Effect	Residual efects
Human	High	Low	Very low.	Not significant.	Not significant.
Controlled waters (groundwater).	Medium	Low	Very low.	Not significant.	Not significant.
Controlled waters (surface water).	Low	Very low.	Very low.	Not significant.	Not significant.
Property (existing/future structures and services).	Low	Very low.	Very low.	Not significant.	Not significant.
Property (crops and livestock).	Medium	Low	Very low.	Not significant.	Not significant.

ii) Operation

11.9.14. The operation would potentially introduce new sources of contamination. Spillages and leaks may occur and below ground services could create additional potential pathways for the migration of potential contamination that were not present at baseline. With mitigation measures incorporated an overall minor beneficial effect is anticipated. These effects would not be significant.

11.9.15. Effects during the operational phase are summarised in **Table 11.9.4** below.

d) Additional mitigation and monitoring

11.9.16. The preliminary assessment of effects presented above identifies no adverse significant effects during construction and operation in relation to land quality. Additional measures to mitigate significant adverse effects are not therefore required.

e) Preliminary assessment of residual effects

11.9.17. No additional mitigation is proposed beyond the embedded measures described above and the residual effects for all phases of development would remain the same as those described above in the preliminary assessment of effects. The effects would be minor beneficial and would not be significant.

f) Completing the assessment

11.9.18. Once the proposals for the Sizewell C project as a whole are finalised, a full land quality assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

11.9.19. A summary of the significance of overall effects is provided in **Table 11.9.5** and **Table 11.9.6**.

Table 11.9.4 Operational phase effects for the proposed development

Receptor	Value/Sensitivity	Baseline risk	Operation risk	Effect
Human	High	Low	Very low.	Not significantl
Controlled waters (groundwater).	Medium	Low	Very low.	Not significantl
Controlled waters (surface water).	Low	Very low.	Very low.	Not significantl
Property (existing/future structures and services).	Low	Very low.	Very low.	Not significantl
Property (existing/future crops and livestock).	Medium	Low	Very low.	Not significantl

Table 11.9.5 Summary of effects for construction phase

Geology and land quality

Receptor	Value/Sensitivity	Baseline risk	Operation risk		Effect
Current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Incorporate mitigation measures into the construction process, as set out in the CEMP.	Not significant.	Not required.	Not significant.
Controlled waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant.		Not significant.
Property receptors (services/ structures, crops and livestock).	Contamination from on-site sources.		Not significant.		Not significant.

Table 11.9.6 Summary of effects for operational phase

Geology and land quality

Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Current and future on-site and off-site human health receptors.	Contamination from on-site sources.	Construction methodology and associated mitigation measures would prevent impacts during operation. Operation in accordance with the relevant regulations and good practice.	Not significant.	Not required.	Not significant.
Controlled waters receptors (groundwater and surface water).	Contamination from on-site sources.		Not significant.		Not significant.
Property receptors (services/ structures, crops and livestock).	Contamination from on-site sources.		Not significant.		Not significant.

11.10. Groundwater

a) Baseline environment

11.10.1. Details on the geology of the A12/B1122 roundabout site are provided in **section 11.9 Geology and land quality**.

11.10.2. The head deposits (where present) are classified as a Secondary Aquifer (Undifferentiated)[9] (Ref. 11.10.1).

11.10.3. The Crag Group bedrock underlying the site in classified as a Principal Aquifer[10].

11.10.4. There are no groundwater Source Protection Zones (SPZ)[11] within 1km of the site.

11.10.5. Contours shown on British Geological Survey (BGS) hydrogeological mapping (Ref. 11.10.2) suggest that Crag groundwater levels at the site are around 7m above Ordnance Datum (AOD) (approximately 10m bgl). These contours are based on data from 1976 and are only indicative of current levels, however the hydrogeological regime is not considered likely to have changed significantly in the intervening years.

11.10.6. Three groundwater abstractions are indicated within 1km of the site, all related to agricultural use (Ref. 11.10.3). These are approximately located between 100m and 900m from the site and are used for agricultural purposes.

11.10.7. The site is located on the Waveney and East Suffolk Chalk and Crag groundwater body (Water Framework Directive reference GB40501G400600) (Ref. 11.10.4). This groundwater body has been classified by the Environment Agency as being of Poor Quantitative and Poor Chemical status, with an objective of being of Good Quantitative and Good Chemical status by 2027. The Poor Chemical status is attributed to impacts from agriculture as evidenced by elevated nitrate concentrations in groundwater. The proposed roundabout falls within a groundwater Nitrate Vulnerable Zone (NVZ).

11.10.8. Given the local geology and depth to groundwater, there is not considered to be a connection between groundwater and surrounding surface water features. Surface water features are discussed further in **section 11.11**.

11.10.9. The Suffolk Coastal and Waveney District Strategic Flood Risk Assessment (SFRA) makes no reference to groundwater flooding across the Suffolk Coastal and Waveney District (Ref. 11.10.5). Flood risk is discussed further in **section 11.12** below.

11.10.10. There is no known land contamination on the site. Land quality is further assessed in **section 11.9**, **Geology and land quality**.

b) Environmental design and embedded mitigation

i) Construction

11.10.11. Construction drainage would likely be contained within the site, with drainage to ground.

11.10.12. The CEMP would specify the measures required during enabling works and construction, which could include, but not be limited to:

- implementation of working methods during construction, to ensure there would be no surface water run-off from the works, or any stockpiles, into adjacent surface watercourses/leaching into underlying groundwater, in accordance with best practice;
- implementation of appropriate pollution incident control e.g. plant drip trays and spill kits;
- implementation of appropriate and safe storage of fuel, oils and equipment during construction;
- implementation of an appropriate Materials Management Plan (MMP) to document how the excavated materials will be dealt with; and
- implementation of a SWMP.

11.10.13. Remediation of soil/groundwater contamination (e.g. source removal, treatment or capping) and ground stabilisation/improvement works would be undertaken if further investigation and risk assessments deemed it necessary.

11.10.14. The drainage/flood prevention strategies would consider the ground conditions including the permeability of the strata and the level of contamination present on-site.

[9] Secondary Undifferentiated Aquifer - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

[10] Principal Aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

[11] Groundwater Source Protection Zones are areas defined around groundwater sources used for public drinking water supply. The SPZ shows the risk of contamination from activities that might cause pollution in the area. The closer the activity, the greater the risk.

ii) Operation

11.10.15. There would be sufficient space within the site boundary to construct an effective drainage network that, in accordance with highway authority standards, would accommodate the new roundabout and the existing A12 and B1122 carriageways.

11.10.16. Drainage features would remove surface water run-off. Underground drains would convey the run-off into a detention pond located between the proposed roundabout and the existing B1122 carriageway, from where the water would be infiltrated to ground.

11.10.17. It is anticipated that the surface water run-off would be clean run-off and not contaminative in nature. However, the incorporation of petrol/oil interceptors within the drainage design may be required if considered necessary.

c) Preliminary assessment of effects

i) Construction

11.10.18. Due to the shallow excavation depths at the site, it is considered unlikely that the construction phase would have an impact on the groundwater level and flow regime.

11.10.19. Considering both the baseline conditions of the site and the environmental design and embedded mitigation, there would be no significant effects at the site on groundwater.

ii) Operation

11.10.20. Water falling onto impermeable surfaces would be channelled into SuDS infrastructure, meaning the total volume of infiltration entering the ground would not change significantly.

11.10.21. The main risks from contamination would be fuel spills or leaks from vehicles using the roundabout and adjoining roads. Contamination from these sources would likely be of limited magnitude and longevity and would be mitigated through the SuDS infrastructure.

11.10.22. Considering both the baseline conditions of the site and the environmental design and embedded mitigation, there would be no significant effects on groundwater at the site.

d) Additional mitigation and monitoring

11.10.23. Periodic inspection and maintenance of the drainage infrastructure would be required to ensure the continued efficacy of the surface water drainage system.

e) Preliminary assessment of residual effects

11.10.24. There would no significant adverse residual effects during the construction or operational phases.

f) Completing the assessment

11.10.25. Once the proposals for the Sizewell C project as a whole are finalised, the full groundwater assessment of the proposals would be completed as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 11.10.1 Summary of effects for construction phase

Groundwater

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Crag groundwater (Principal Aquifer); head deposits (Secondary Undifferentiated Aquifer); Groundwater abstractions within 1km of the site.	Leaching and migration of existing contaminants from soils in the unsaturated zone into groundwater in underlying aquifers.	Ensuring all site activities are carried out in accordance with the CEMP. Remediation of on-site contamination if required. Appropriate drainage design.	Not significant.	Not required.	Not significant.
	Migration of contaminants via preferential pathways to deeper groundwater.		Not significant.		Not significant.
	Construction materials and the use of construction vehicles have the potential to introduce contamination to groundwater via drips and spillages and infiltration of run-off from the construction site.		Not significant.		Not significant.

Table 11.10.2 Summary of effects for operation phase

Groundwater

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Crag groundwater (Principal Aquifer); head deposits (Secondary undifferentiated); Groundwater abstractions within 1km of the site.	Increase in the impermeable area of ground cover at the development site.	Water draining from the road will be diverted to a detention pond whereby it will be infiltrated to ground. Oil interceptors may be required.	Not significant.	Periodic inspection and maintenance of the SuDS infrastructure.	Not significant.
	Fuel spills or leaks infiltrating to groundwater.		Not significant.		Not significant.

11.11. Surface water

a) Baseline environment

i) Surface water features

11.11.1. The proposed roundabout is located in the Minsmere Old River catchment. Light Detection and Ranging data show that the highest ground levels are located in the south of the site, approximately 16m AOD. Ground levels drop to the west and east of the site, with the lowest ground levels at approximately 10m AOD at the south-west edge.

11.11.2. The River Yox, a tributary of the Minsmere River, is located approximately 80m north of the proposed roundabout at its closest point. The Environment Agency's Catchment Data Explorer (Ref. 11.11.1) defines the reach in the vicinity of the site as Minsmere Old River water body (water body reference GB105035046270) and it is a Main River. Overall, the ecological potential of the Minsmere Old River is 'Moderate' as a result of a Poor status for fish. An unnamed tributary of the River Yox is located 100m to the east of the site.

11.11.3. There are several ponds in the vicinity of the site, including one pond to the north-east of the site boundary. A sewage treatment works is located north-east of the proposed A12/B1122 roundabout, between the site and the River Yox.

ii) Fluvial geomorphology

11.11.4. Geomorphology and hydromorphology are key factors contributing to whether a water body can achieve or maintain Good ecological status.

11.11.5. The Minsmere Old River water body is designated as a Heavily Modified Water Body (HMWB). The geomorphology and hydrological regime are of sufficient quality to support Good ecological status.

iii) Water quality

11.11.6. Physico-chemical and chemical data presented on Catchment Data Explorer have been reviewed for the Minsmere Old River in the vicinity of the proposed site boundary.

11.11.7. The physico-chemical status of the Minsmere Old River is Good or High for ammonia, biochemical oxygen demand (BOD), dissolved oxygen (DO), pH and temperature. These variables are not adversely affected by pollutants such as ammonia, copper, triclosan and zinc, and hence the physico-chemical status of the water body is Good.

b) Environmental design and embedded mitigation

i) Construction

11.11.8. It is proposed that construction drainage would be contained within the site and infiltrated to ground. Where appropriate, the existing drainage system would be used (i.e. at the junction with the existing A12 and the B1122).

11.11.9. Petrol/oil interceptors would be incorporated within the drainage infrastructure, where considered necessary.

11.11.10. Mitigation measures would be incorporated into the proposed roundabout construction process and could include, but not be limited to:

- the wheels of all vehicles would be washed before leaving site;
- concrete and cement mixing and washing areas would be situated at least 10m away from surface water receptors. These would incorporate settlement and recirculation systems to allow water to be re-used. The washing of equipment would be undertaken in a contained area, and all water would be collected for off-site disposal;
- all fuels, oils, lubricants and other chemicals would be stored in an impermeable bund with at least 110% of the stored capacity. Spill kits would be available at all times, and damaged containers would be removed from site. All refuelling would take place in a dedicated impermeable area, using a bunded bowser. Biodegradable oils would be used where possible; and
- sand bags or stop logs would also be available for deployment at the outlets from the site drainage system in case of emergency spillages.

ii) Operation

11.11.11. There is sufficient space within the site boundary to construct an effective drainage network, in accordance with Design Manual for Roads and Bridges (DMRB) standards (Ref. 11.11.2), that would accommodate the new roundabout and the existing A12 and B1122 carriageways.

11.11.12. Drainage features would include channels and combined kerb drains or gullies to remove surface water run-off. Underground drains would convey the run-off into a detention pond located between the proposed roundabout and the existing B1122 carriageway, from where the water would be infiltrated to ground. There would be no discharge to local watercourses.

11.11.13. Petrol/oil interceptors would be incorporated within the drainage infrastructure, where considered necessary.

c) Preliminary assessment of effects

i) Construction

11.11.14. During construction, the site would be isolated from the wider environment, including the River Yox. Run-off generated on the site would drain either to ground or via the existing drainage system.

11.11.15. Considering both the baseline conditions of the site and the environmental design and embedded mitigation, there would be no significant effects on surface waters at the site.

ii) Operation

11.11.16. The proposed works would not significantly increase run-off from the site to the River Yox or the existing pond, as the attenuation ponds and existing drainage would intercept run-off. Furthermore, silt traps and hydrocarbon interceptors would be incorporated into the design and as a result, no increase in contaminants would occur in those water bodies.

11.11.17. Considering both the baseline conditions of the site and the environmental design and embedded mitigation result, there would be no significant effects on surface water at the site.

d) Additional mitigation and monitoring

11.11.18. Once operational, periodic inspection and maintenance of the drainage infrastructure would be required to ensure the continued efficacy of the drainage system.

e) Preliminary assessment of residual effects

11.11.19. No significant adverse residual effects are expected during the construction or operational phases.

f) Completing the assessment

11.11.20. The current assessment is conservative, based on the design information currently available. The final design of the proposed roundabout, the need for mitigation and its form, will be determined in liaison with the relevant authorities.

11.11.21. Once the proposals for the Sizewell C development are finalised, a full assessment of potential effects on the surface water environment from the proposals would be completed as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 11.11.1 Summary of effects for construction phase

Surface water

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
River Yox.	Contamination of the river.	Attenuation pond, silt traps and hydrocarbon interceptors. Adoption of pollution prevention measures through CEMP (e.g. wheel washing and separation of working areas from surface waters).	Not significant.	None	Not significant.
Existing pond to the east of the site.	Habitat loss.	The existing pond will be retained and incorporated into the revised drainage regime.	Not significant.		Not significant.
	Pollution of controlled waters.	Silt traps and hydrocarbon interceptors will be incorporated into the design.	Not significant.		Not significant.

Table 11.11.2 Summary of effects for operational phase

Surface water

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
River Yox.	Contamination of the river.	Attenuation pond, silt traps and hydrocarbon interceptors.	Not significant.	Inspection and maintenance of drainage system.	Not significant.
Existing pond to the east of the site.	Pollution of controlled waters.	Silt traps and hydrocarbon interceptors. Active management and maintenance of the drainage system to maximise its efficacy.	Not significant.	Inspection and maintenance of drainage system.	Not significant.

11.12. Flood risk

11.12.1. The figures for Flood Risk are presented in **Volume 3** as **Figures 11.12.1** and **11.12.2**.

a) Baseline environment

11.12.2. The site topography is gently undulating and slopes northwards. The proposed roundabout would be sited on a ridge of high ground that drains into two discreet catchments, to the east and the west respectively.

11.12.3. The site runs north to the bridge that marks the boundary between the River Yox and Minsmere River, both of which are classed as Main Rivers. The Environment Agency 'flood risk from rivers or the sea' mapping indicates the site is entirely located within Flood Zone 1 and has a low risk of fluvial flooding (**Figure 11.12.1**). There is an unnamed ordinary watercourse to the south-east of the site that flows north and discharges in the Minsmere River.

11.12.4. There is an existing pond just beyond the site's eastern boundary and a water treatment plant approximately 100m to the north-east.

Table 11.12.1 Summary of flood risk at the development site

Source of flooding	Flood risk
Fluvial	Low: less than 1 in 1,000 annual probability of river flooding in any year (<0.1%).
Tidal/coastal	Low: The site is beyond the tidal extent, i.e. less than 1 in 1,000 annual probability of tidal flooding in any year (<0.1%).
Surface water (pluvial)	Very Low: less than 1 in 1,000 annual probability of surface water flooding in any year (<0.1%).
Groundwater	Low - Medium: soil is permeable but the site is located in higher ground levels than some surrounding areas and is close to an existing pond and watercourse. The pond located to the east of the site boundary suggests the potential for near surface level ground water.
Sewers	Low: greenfield site and surrounding arable land and sewers have not currently been identified on the site.
Reservoirs	Low: no risk of flooding from reservoirs identified.

11.12.5. There are two areas within the site boundary identified as having low to high flood risk. These areas are located at the western end of the site, along the existing A12 and on the eastern site boundary. The majority of the site is at very low risk of surface water flooding (**Figure 11.12.2**).

b) Environmental design and embedded mitigation

11.12.6. The Sequential Test aims to steer new development away from areas of high flood risk. The positioning of the site in Flood Zone 1 complies with this requirement. There would be no loss in the functional floodplain.

i) Construction

11.12.7. It is likely the majority of the site would be isolated from adjacent land parcels, by the construction of shallow perimeter bunds and ditches at an early stage of construction. The bunds would ensure surface water run-off would be contained within the site before infiltrating to ground while ditches outside the proposed bunds would capture any off-site run-off that would otherwise have flowed onto the site.

11.12.8. Monitoring and maintenance of construction phase works would be carried out to preserve integrity and maintain design standard.

ii) Operation

11.12.9. It is likely that infiltration to ground would be viable at this site. SuDS would be designed and constructed in accordance with highway authority standards. There is sufficient space within the site boundary to construct an effective drainage network that would accommodate the roundabout and existing A12 and B1122 carriageways.

11.12.10. The drainage system would consist of channels, kerb drains or gullies that would remove surface water run-off. Underground drains would convey the run-off to a detention pond located between the proposed roundabout and existing B1122 carriageway. This pond would hold surface water and dispose of it by infiltration to ground. There would be no discharge to local watercourses. This drainage approach would prevent any additional surface water run-off from the new roundabout flowing on to the existing A12 at Brook Street.

11.12.11. Climate change would be considered in the detailed drainage design, in particular future changes in rainfall intensity. The drainage design would also consider exceedance flows.

11.12.12. Monitoring and maintenance of the drainage system would be carried out to preserve its integrity and maintain its design capacity.

c) Preliminary assessment of effects

11.12.13. During construction, the use of temporary perimeter bunds and ditches, created at an early stage, would ensure that a significant effect on flood risk is unlikely during this phase.

11.12.14. During operation, the proposed drainage system would attenuate surface water run-off, resulting in no significant effect on flood risk. Accommodation of the existing A12 and B1122 carriageways in the drainage system could have a beneficial impact on surface water flood risk.

d) Additional mitigation and monitoring

11.12.15. No additional measures are required.

e) Preliminary assessment of residual effects

11.12.16. Monitoring and maintenance, together with suitable design for exceedance flows, would manage the residual risk to result in negligible effects, so there would be no significant residual effects.

f) Completing the assessment

11.12.17. A full flood risk assessment for this site would be submitted as part of the application for development consent after the proposals for the Sizewell C project as a whole are finalised.

Table 11.12.2 Summary of effects for construction phase

Flood risk

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Surface water	Increase in impermeable area and associated surface water run-off during construction of site.	Shallow perimeter bunds constructed to contain surface water run-off on-site. Monitoring and maintenance of bund to preserve integrity and maintain design standard.	Not significant	None required	Not significant
	Off-site surface water prevented from crossing the site.	Perimeter ditch constructed outside of the perimeter bunds to intercept off-site surface water flows. Monitoring and maintenance of ditch and bunds to preserve integrity and maintain design standard.	Not significant	None required	Not significant

Table 11.12.3 Summary of effects for operational phase

Flood risk

Topic / Receptor	Impacts	Environmental Design and Embedded Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Surface water	Increase in impermeable area and associated surface water run-off from the site.	Surface water from impermeable areas discharged to infiltration SuDS including an allowance for climate change. incorporation of the management of existing areas of flood risk into the drainage design. Monitoring and maintenance of SuDS to preserve integrity and maintain design standard.	Beneficial	None required	Not significant

11.13. Traffic and transport

a) Baseline environment

11.13.1. The B1122 meets the A12 at the northern end of Yoxford village at a ghost island junction. The junction is located on the outside of a slight bend in the A12, with the topography rising to the north along the A12. The A12 carries approximately 14,700 vehicles per day between the A1120 and B1122 junctions, and approximately 14,000 vehicles per day north of the B1122. The B1122 itself carries approximately 3,450 vehicles per day at the junction with the A12.

11.13.2. Traffic analysis has identified that improvements to the A12/B1122 ghost junction would be required to increase capacity during peak times to accommodate increasing volumes of traffic using this junction, even in the absence of Sizewell C construction traffic.

11.13.3. The B1122 crosses the East Suffolk line by means of a level crossing approximately 600m east of the A12/B1122 junction.

11.13.4. A short section of side road provides access to a number of properties on the southern side of the B1122 approaching the existing junction.

11.13.5. A review of accident data shows that in the five-year period between 2013 and 2017 inclusive, four accidents of 'slight' severity occurred at the A12/B1122 junction and a further two 'slight' accidents occurred on the northern approach to the junction.

b) Environmental design and embedded mitigation

i) Construction

11.13.6. The proposed A12/B1122 roundabout would be constructed approximately 100m to the north of the existing ghost island junction.

11.13.7. Locating the roundabout off-line (i.e. offset from the A12) would reduce the disruption to existing traffic, which would be able to use the existing A12 and B1122 junction during construction of the roundabout. In this way, queuing along the A12 could be avoided for the majority of the construction period.

11.13.8. Retention of the existing A12/B1122 junction for the majority of the roundabout construction period would also maintain unchanged access to the residential properties south of the B1122 during the construction period.

11.13.9. It is proposed that the construction staff working on the construction of the roundabout would park at the nearby northern park and ride site and travel by bus to the A12/B1122 site, thereby minimising the need for vehicles to park at the junction.

ii) Operation

11.13.10. The proposed roundabout would prevent queues on the B1122 extending back through the B1122 level crossing. These capacity improvements would come into operation earlier than would have been the case without the construction of Sizewell C.

11.13.11. The roundabout design would incorporate an overrun area in its centre to allow abnormal indivisible loads serving the Sizewell B and Sizewell C sites to cross the roundabout in a way which minimises the delay to other traffic.

11.13.12. The proposed design would maintain access to both Satis House and to the row of houses south of the junction, thereby minimising inconvenience to residents and visitors.

c) Preliminary assessment of effects

i) Construction

11.13.13. A small contractor's compound would be required during the construction of the roundabout; this is currently proposed to be located to the north of the B1122 approaching the site of the roundabout. Construction vehicles would access the compound via the B1122.

11.13.14. During the off-line phase of construction of the roundabout, effects on traffic delay are anticipated to be negligible as the volumes of construction vehicles serving the roundabout site would be minimal compared to existing volumes of traffic using the A12.

11.13.15. During the peak period of its construction, the A12/B1122 roundabout is anticipated to be served by 10 HGVs and 30 construction workers per day. The impact of these vehicles on traffic would be minor and the effect of these movements would not be significant.

11.13.16. Some disruption to traffic flow would be anticipated during the final phase of construction when the new roundabout is connected to the existing A12 and B1122. Some use of temporary traffic signals may be required which would lead to queuing on the approaches to the junction. This would lead to a minor negative impact on traffic and the effect would not be significant.

11.13.17. Construction traffic using the contractor's compound would approach via the A12 and would not therefore increase the number of vehicles using the level crossing on the B1122; consequently, the risk rating of the level crossing would not rise and no changes to the level crossing type would be required.

11.13.18. At the final stage of construction of the roundabout, use of temporary traffic signals or other means of traffic management could increase the queue lengths on the B1122. The temporary signal timings would be set to minimise the risk of the queue extending back to the level crossing. Existing signage is already in place at the level crossing warning users to not proceed across the tracks until the other side is clear of vehicles. There would be negligible negative impact on the operation of the level crossing which would not be significant.

ii) Operation

11.13.19. The creation of a roundabout at the junction of the A12 and B1122 would reduce queuing on the B1122 approach, bringing about a reduction in journey times. The VISSIM modelling shows that the roundabout has sufficient capacity to accommodate the forecast flows. There would be a minor beneficial effect for traffic using the B1122 but this would not be significant.

11.13.20. Under the rail-led strategy, the Sizewell link road would not be built and therefore Sizewell C construction traffic from both north and south would still access the B1122 from the A12 at Yoxford. The proposed roundabout would be used by approximately 6,250 vehicles per day along the B1122 arm. This would represent an increase of 36% over the Reference Case (without the construction of Sizewell C) volume of 4,600 vehicles per day in 2027.

11.13.21. Under this strategy, 18,200-18,450 vehicles per day would use the southern A12 arm and 17,100-17,350 vehicles would use the northern A12 arm.

11.13.22. Under the road-led strategy, traffic from the south would access the B1122 at the Sizewell link road, rather than at Yoxford. On a typical day during the peak period of Sizewell C construction there would be 5,300-5,600 vehicles per day travelling along the B1122 immediately east of the proposed roundabout. This would represent an increase of 15%-22% over the Reference Case (without the construction of Sizewell C) volume of 4,600 vehicles per day in 2027. This is lower than under the rail-led strategy as the traffic effect of the Sizewell link road is greater than the additional HGV volume under the road-led strategy.

11.13.23. Under this strategy, 16,900-17,750 vehicles per day would use the southern A12 arm of the roundabout, lower than under the rail-led strategy. Some 17,100-17,350 vehicles would use the northern A12 arm, which is the same as under the rail-led strategy.

11.13.24. The volumes of pedestrians using this junction are minimal (and are not anticipated to increase as a result of the roundabout's installation), and the proposed roundabout still represents a modest improvement in pedestrian amenity compared to the existing ghost island junction. The roundabout would feature built islands on each approach, enabling pedestrians to cross in two stages. This would bring a minor beneficial effect for pedestrians but this would not be significant.

d) Additional mitigation and monitoring

i) Construction

11.13.25. If construction of the northern park and ride is sufficiently advanced, it could be used as a base to transport workers to the roundabout construction site by mini-bus, further reducing the impact, removing the need for on-site construction staff parking.

ii) Operation

11.13.26. No additional mitigation or monitoring is anticipated during the operational phase.

e) Preliminary assessment of residual effects

11.13.27. The residual effects during construction and operation are anticipated to be the same as those set out under preliminary effects described above.

f) Completing the assessment

11.13.28. Once the design for the A12/B1122 roundabout is developed further, the environmental assessment can be further refined.

11.14. Comparison between rail-led and road-led strategies

11.14.1. The design of the Yoxford Roundabout is identical under both the road-led and rail-led strategies and so the assessments presented in this chapter in relation to landscape and visual, terrestrial ecology, amenity and recreation, terrestrial historic environment, soils and agriculture, geology and land quality, groundwater, surface water and flood risk are equally valid under both strategies and there would be no differences in the significance of effects between the two.

11.14.2. The traffic and transport assessment presented in this chapter is also broadly valid under both strategies. As noted above, during the peak of construction of Sizewell C, under a rail-led strategy approximately 6250 vehicles per day would use the B1122 arm of the roundabout, whilst approximately 5,300-5,600 vehicles per day would use it under the road-led strategy (as other vehicles would carry on to the new Sizewell link road). Noise and air quality levels would vary only slightly between the strategies and it is therefore unlikely there would be any significant difference in the effects.

12. Highway Improvements PEI

12.1. Introduction to preliminary Environmental information for other highways improvements

12.1.1. As explained in **Volume 1, Chapter 17**, the construction of Sizewell C would generate additional vehicular traffic on the local highway and transport networks due to the daily movement of large numbers of construction workers, as well as the movement of large amounts of building materials and equipment. To limit the adverse transport effects, and address capacity and safety issues on the networks, mitigation measures have been developed using detailed transport modelling techniques.

12.1.2. The approach includes a number of highway improvements including localised highway improvements to the local road network which would be implemented under both the rail-led or road-led strategies. One of the improvements would only be built under a rail-led strategy, this being the Mill Street improvement on the B1122 (see below), since under a road-led strategy the construction of the Sizewell link road would negate the need for this improvement.

12.1.3. This chapter provides Preliminary Environmental Information (PEI) for the following four highway improvements:

- Wickham Market diversion route via Valley Road and Easton Road outlined in **Volume 1, Chapter 17, section 17.9**;
- Mill Street (B1122) junction, outlined in **Volume 1, Chapter 17, section 17.10**;
- A1094/B1069 south of Knodishall, outlined in **Volume 1, Chapter 17, section 17.6**; and
- the A12/A144 south of Bramfield outlined in **Volume 1, Chapter 17, section 17.8**.

12.1.4. These highways improvements are described in greater detail and a plan of the locations is provided at the relevant sections in **Volume 1, Chapter 17**. The highway improvements at the other locations outlined in **Volume 1, Chapter 17** are considered to be of scale at which significant effects are unlikely to arise and no PEI is presented for those improvements.

12.1.5. The proposed works for the four improvements covered in this chapter are likely to have some effects on the environment during construction and operation. The highways improvements assessed within this PEI chapter would be permanent and therefore there is no consideration of a removal and reinstatement phase.

12.1.6. The principal likely significant adverse and beneficial effects are explained below. The potential for significant effects is limited given that the proposed works consist primarily of highway widening and junction works. In order to simplify the text, some sections within each technical assessment, such as embedded mitigation measures, cover all of the four improvements as the type of embedded mitigation measures applied are likely to be common to each of the proposed works. The approach within individual assessments also varies in order to minimise repetition of similar details and some technical assessments such as terrestrial historic environment use a simpler structure. However, the potential for significant effects is still addressed.

12.1.7. The highways improvements assessed in this chapter are considered unlikely to lead to significant adverse effects on air quality and have therefore been scoped out of detailed assessment for this topic. The proposed works may generate very local dust impacts typical of small highway works but these would be controlled using appropriate methods and no significant effects are predicted. Similarly, and given the limited scope of the highway improvement works, no assessment is provided for the traffic and transport effects of these proposed works. In general terms, the improvements would all have a beneficial effect on the highways as they are specifically designed to minimise the potential of adverse traffic effects during the construction of Sizewell C. Any effects during construction would be localised and typical of minor and routine highways works.

12.2. Landscape and visual

12.2.1. The figures for landscape and visual are presented in **Volume 3** as **Figures 12.2.1** to **12.2.4**.

a) Baseline environment

i) Wickham Market highway improvements

12.2.2. The Wickham Market highway improvements are aligned along existing minor roads and immediately adjacent farmland margins from the B1078 west of Wickham Market, along Valley Road past Valley Farm and Riding and Driving Centre, over Glevering Bridge and then along Easton Road to join the B1116 north of Wickham Market. Valley Road is relatively narrow with tall hedgerows to either side, opening out in front of Valley Farm before narrowing again and becoming more winding east of the farm. Glevering Bridge is a listed structure (see **terrestrial historic environment section** for further detail), and is relatively narrow. North and east of the bridge the route becomes wider, and is lined by vegetation. Along these wider stretches of the route, vegetation is frequently wide tree belts or woodland.

12.2.3. Topography along the proposed route is gently undulating, running through the valley of the River Deben.

12.2.4. At a national level, the area for the proposed improvements and much of the surrounding area is situated within National Character Area 83 (NCA83): South Norfolk and High Suffolk Claylands (Ref. 12.2.1). NCA83 covers a large area of central East Anglia and is a predominantly flat clay plateau incised by numerous small-scale wooded river valleys. The valley of the River Deben is one of these characteristic wooded river valleys.

12.2.5. At the local level, the proposed route improvements would take place across a series of landscape character types, including 'ancient estate claylands', 'rolling valley claylands', 'valley meadowlands', 'rolling estate claylands' and into 'plateau estate farmlands' as identified in the Suffolk County Landscape Character Assessment (Ref. 12.2.2) and shown on **Figure 12.2.1**. Each of these landscape character types can be summarised as follows:

- Ancient estate claylands – an ancient wooded landscape of arable farms, associated with low lying valley floors and undulating glacial plateaus.
- Valley meadowlands – a flat valley floor grassland on silty and peat soils.
- Rolling estate claylands – a valley side landscape of clay loams with parklands and fragmented woodland.
- Plateau estate farmlands – a largely arable landscape with scattered woodland cover, which often feels open.

12.2.6. Views of the proposed development would generally be restricted to within approximately 100 metres (m) or less of the site boundary, due to the presence of existing mature vegetation along roadsides.

12.2.7. The locations of different groups of people within the vicinity of the proposed improvements who may experience views of the proposed development are shown in **Figure 12.2.1**. The key visual receptors within the study area include the following:

- The transport routes along which the improvements would take place.
- Recreational routes including two bridleways that join Easton Road, one mid-way along the route and running north-east towards Hacheston Lodge and a second located towards the eastern end of the road and running southwards towards Wickham Market.
- Dispersed farmsteads and residential properties along the route, including Valley Farm, Glevering Mill and Glevering Hall Farm.

12.2.8. The Suffolk Coasts and Heaths Area of Outstanding Natural Beauty (AONB) is located approximately 5 kilometres (km) to the south-east of the site.

12.2.9. The site is located within a locally designated landscape covering the valley of the River Deben. This is referred to as a Special Landscape Area (SLA).

ii) Mill Street improvements

12.2.10. The improvements to Mill Street on the B1122 would take place on a short stretch of the existing road. The route is currently a single carriageway rural road, with hedgerows to either side. There are residential properties along the road to the east and west of the proposed improvements. Immediately adjacent to the road, beyond the residential properties, are small scale fields of grassland or arable cropping. Beyond these fields, the farmland becomes predominantly large scale arable, with some grassland along a minor valley. Topography in the vicinity of the proposed improvements is gently undulating, running across the valley slopes of a tributary of the Minsmere River and sloping upwards from west to east.

12.2.11. At a national level, the proposed improvements and much of the surrounding area are situated within

National Character Area 82 (NCA82): Suffolk Coast and Heaths (Ref. 12.2.3). NCA82 comprises low-lying gently undulating farmland with areas of woodland, heath and forest plantation.

12.2.12. At the local level, the proposed improvements would be located within the rolling estate claylands character type as identified in the Suffolk County Landscape Character Assessment and shown on **Figure 12.2.2**. The rolling estate claylands is a valley side landscape of clay loams with parklands and fragmented woodland and is described above.

12.2.13. Views of the highway improvements would generally be restricted to within 350m or less of the site boundary, due to the presence of existing mature vegetation along roadsides and the undulating topography.

12.2.14. The locations of different groups of people within the vicinity of the proposed improvements who may experience views of the proposed development are shown on **Figure 12.2.2.** The key visual receptors within the study area include the following:

- Users of the B1122 and Mill Street, along which the improvements would take place.
- Users of recreational routes including two public footpaths, one approximately 80m to the west of the proposed improvements and one approximately 300m to the south-east.
- Dispersed farmsteads and residential properties along the B1122 and Mill Street, including Garden House Farm.

12.2.15. Visibility from many of these locations is likely to be limited due to a combination of existing roadside vegetation and undulating topography.

12.2.16. The Suffolk Coasts and Heaths AONB is located approximately 1.8km to the east of the site.

12.2.17. The site is located on the edge of a locally designated landscape covering the valley of Minsmere River. This is referred to as an SLA.

iii) A12/A144 junction improvements

12.2.18. The improvements to the junction of the A12 and A144 near Darsham would take place on a short stretch of both existing roads around the existing junction. The route is currently a single carriageway rural road, with intermittent hedgerows to either side. There are residential properties along the road to the north and south of the proposed improvements. Beyond the garden boundaries of these residential properties, land use is predominantly large scale arable farmland. Topography in the vicinity of the proposed improvements is gently undulating, with the junction itself located on a plateau area.

12.2.19. At a national level, the proposed improvements and much of the surrounding area are situated within National Character Area 83 (NCA83): South Norfolk and High Suffolk Claylands. NCA83 covers a large area of central East Anglia and is a predominantly flat clay plateau incised by numerous small-scale wooded river valleys. The proposed improvements would be located on a plateau area.

12.2.20. At the local level, the proposed improvements would be located within the ancient estate claylands character type (see above for characterisation).

12.2.21. Views of the proposed development would generally be restricted to within 350m or less of the site boundary, due to the presence of existing mature vegetation along roadsides.

12.2.22. The locations of different groups of people within the vicinity of the proposed improvements who may experience views of the proposed development are shown on **Figure 12.2.3**. The key visual receptors within the study area include the following:

- Users of the A12 and A144, along which the improvements would take place.
- Users of recreational routes including two public footpaths, one approximately 120m to the north-east of the proposed improvements and one approximately 60m to the south-west.
- Dispersed farmsteads and residential properties along the A12.

12.2.23. Visibility from some of these locations is likely to be limited due to the presence of existing mature vegetation.

12.2.24. The Suffolk Coasts and Heaths AONB and the SLA designations are all located outside the area where visibility of the proposed improvement works is considered likely.

iv) A1094/B1069 junction improvements

12.2.25. The improvements to the junction of the A1094 and B1069 near Knodishall would take place on a stretch of both existing roads and adjacent land around the existing junction. The route is currently a single carriageway rural road, with woodland and hedgerows to either side. There is a single residential property at the existing road junction. Beyond the garden boundary of the residential property, there are areas of woodland and land use is predominantly large scale arable farmland. Topography in the vicinity of the proposed improvements is gently undulating, with the junction itself located on a plateau area.

12.2.26. At a national level, the proposed improvements and much of the surrounding area are situated within National Character Area 82 (NCA82): Suffolk Coast and Heaths. NCA82 comprises low-lying gently undulating farmland with areas of woodland, heath and forest plantation.

12.2.27. At the local level, the proposed improvements would be located within the estate sandlands character type as identified in the Suffolk County Landscape Character Assessment and shown on **Figure 12.2.4**. The 'estate sandlands' landscape character type is a flat or very gently rolling landscape of sandy soils covering the Brecks and parts of the Suffolk coast.

12.2.28. Views of the proposed development would generally be restricted to within a few metres of the site boundary, due to the small scale proposals and the presence of existing mature vegetation along roadsides.

12.2.29. The locations of different groups of people within the vicinity of the proposed improvements who may experience views of the proposed development are shown on **Figure 12.2.4**. The key visual receptors within the study area include the following:

- Users of the A1094 and B1069, along which the improvements would take place.
- Users of the public bridleway that currently joins the junction of the A1094 and B1069 from the south-west.
- Residents of the property at the existing junction.

12.2.30. The Suffolk Coasts and Heaths AONB is located along the south-western edge of the site.

12.2.31. The SLA designations are all located outside the area where visibility of the proposed improvement works is considered likely.

b) Environmental design and embedded mitigation

12.2.32. Existing trees and hedgerows adjoining the boundaries of each of the sites would be retained where possible. Where hedgerow removals are required for any of the improvements, it is likely that replacement hedgerows would be planted beyond the edge of the improvement works, subject to land availability.

12.2.33. Effects on residential amenity would be mitigated via planting as appropriate to each case, including replanting of garden boundary vegetation if the improvement works require the removal of the existing vegetation.

c) Preliminary assessment of effects

i) Construction

12.2.34. During construction, there would be a localised change to the landscape character of the highways improvement sites and their immediate context. This would arise primarily due to vegetation loss and some local reprofiling of landforms.

12.2.35. There would also be localised visual effects for road users. Given the nature of the changes, the limited extent and the temporary duration of these effects, they are unlikely to be significant.

ii) Operation

12.2.36. For all of the highway improvement schemes, during operation, there would be a very localised effect on the character of the landscape within the site.

12.2.37. Given the very localised effect of the proposals and the existing presence of road infrastructure within the sites, these effects are unlikely to be significant. There are unlikely to be any significant effects on landscape character from any of the highway improvement schemes.

12.2.38. For all of the proposed highways improvements, there would be no visibility of the proposals from any settlements.

12.2.39. For users of the roads in the vicinity of the highways improvements, there would be localised visibility of the proposals from nearby locations. However, given that the proposals would be relatively minor features there are unlikely to be any significant visual effects for users of the identified routes.

12.2.40. For users of recreational routes in the vicinity of the proposed highway improvements, there would be localised visibility of the proposals from a small number of existing Public Rights of Way (PRoWs). However, given the presence of the existing roads at which the improvements would take place, the proposed highways improvements are unlikely to result in significant visual effects for users of any of these recreational routes.

12.2.41. The proposed highway improvements may be visible from a limited number of properties near to each of the routes to be improved. The majority of rural properties already have hedges and/or trees around them which would help screen views of the proposed works.

12.2.42. There are unlikely to be views of any of the proposed highway improvements from the Suffolk Coasts and Heaths AONB and there would be no direct effects on the AONB. Given the very localised effect of the proposals and the existing presence of road infrastructure within the sites, effects on the SLA covering the valley of the River Deben at the Wickham Market road improvements and the valley of Minsmere River at the improvements to Mill Street on the B1122 are likely to be minimal. There are unlikely to be any significant effects on designated landscapes.

d) Additional mitigation and monitoring

12.2.43. No additional mitigation is proposed.

e) Preliminary assessment of residual effects

12.2.44. No significant residual effects are expected during the construction or operational phases of any of the highway improvements.

f) Completing the assessment

12.2.45. The Environmental Statement (ES) would present a full Environmental Impact Assessment (EIA) underpinning the conclusions drawn above in relation to significant effects, updated where relevant to account for any design changes.

12.3. Terrestrial ecology and ornithology

12.3.1. The figures for terrestrial ecology and ornithology are presented in **Volume 3** as **Figures 12.3.1** to **12.3.2**.

a) Baseline environment

12.3.2. This baseline has been compiled following a detailed review of desk study information, including a data request from the Suffolk Biodiversity Information Service (SBIS) and a review of aerial photographs and Ordnance Survey (OS) maps. A short site visit was undertaken in relation to the Wickham Market highway improvements, A1094/B1069 south of Knodishall, and A12/A144 south of Bramfield. It should be noted that no ecological constraints were recorded during the site visit for A1094/B1069 south of Knodishall and A12/A144 south of Bramfield; therefore, these two locations have not been described or discussed in the subsequent sections.

i) Wickham Market highway improvements

12.3.3. There are no statutory designated sites of nature conservation importance within 5km of the proposed Wickham Market highway improvements.

12.3.4. Nine non-statutory designated County Wildlife Sites (CWSs) are present within 2km of the proposed Wickham Market highway improvements, these being: the River Deben CWS which is adjacent to the proposed Wickham Market road improvement locations at Glevering Bridge; Catts Wood CWS approximately 350m north; Great Wood Glevering Hall CWS approximately 830m north; Potsford Wood CWS approximately 300m west; Home Covert CWS approximately 1.2km south-west; wood adjacent to River Deben CWS approximately 950m north-west; The Oaks CWS approximately 1.8km south; Lower Hacheston Meadow CWS approximately 950m south-east; and Maid's/Brockley Woods CWS approximately 2km north.

12.3.5. Habitats in the vicinity of the proposed Wickham Market highway improvements are described from the junction of Valley Road and the B1078 to the west of Wickham Market, east to the junction of Easton Road with the B1116.

12.3.6. The junction of Valley Road and the B1078 is within arable farmland with hedgerows and dense scrub along the edges of the road. Valley Road then passes through arable fields until it crosses the River Deben at Glevering Bridge. The river here has a large number of riparian trees along its banks. Easton Road is bordered by broadleaved woodland along its northern side and grazing marsh and arable habitats on the southern side. At the eastern end of the proposals, the junction of Easton Road and the B1116 is within arable farmland with a hedgerow along the edges of the road. Deciduous woodland, hedgerows and coastal and floodplain grazing marsh are habitats of principal importance (Ref. 12.3.1, section 41).

12.3.7. A number of notable invertebrate species have been recorded in the wider area. Habitats within the area of proposed highways improvements are unlikely to be of particular importance to invertebrates, or of sufficient size to support significant numbers of notable invertebrates.

12.3.8. There are no records of amphibians in the vicinity of the proposed Wickham Market highway improvements. A review of OS maps and aerial photography identified approximately seven ponds within 500m of the proposed highways improvements which could support great crested newts[1] (*Triturus cristatus*). There are also a number of reservoirs and drains to the south of Easton Road, although these are unlikely to be of value to great crested newts. Habitats such as the woodland, and the field and woodland margins, provide suitable habitat for the terrestrial phase of the species, including potential hibernation sites, and aid connectivity to the wider landscape. However, the very limited areas of potentially suitable habitat within the footprint of the proposed works site are unlikely to be of particular importance to great crested newts.

12.3.9. Habitats within the proposed highways improvements are sub-optimal for reptiles[2] and considered unlikely to be of importance to this species group.

12.3.10. Breeding birds[3] typical of woodland and hedgerows are likely to be present.

12.3.11. Serotine (*Eptesicus serotinus*), Natterer's bat (*Myotis nattereri*), noctule (*Nyctalus noctule*), Nathusius's pipistrelle (*Pipistrelus nathusii*), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*) and brown long-eared bat[4] (*Plecotus auritus*) have been recorded in the wider area. This includes a record of a breeding colony of soprano pipistrelle bats located approximately 150m south of the proposed highways improvements. In addition, there is one record of the rare barbastelle (*Barbastella barbastellus*) from approximately 3km south-east. The hedgerows, broadleaved woodland and mature trees adjacent to Easton Road are likely to be of value to foraging and roosting bat species.

12.3.12. There are records of both otter[5] (*Lutra lutra*) and water vole[6] (*Arvicola amphibious*) on the River Deben.

12.3.13. Desk study records from the SBIS indicate that badgers[7] (*Meles meles*) are widespread along the proposed route of the improvements. Badgers are common and widespread within the local area and although suitable habitat is limited, badger setts could be located within or close to the proposed works.

ii) Mill Street improvements

12.3.14. The only European site within a 5km radius of the proposed B1122 highways improvements is the Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC), Special Protection Area and Ramsar located approximately 1.3km north-east.

12.3.15. There are two nationally designated Sites of Special Scientific Interest (SSSI) within 5km of the proposed highways improvements, these being: Minsmere-Walberswick Heaths and Marshes SSSI located approximately 1.5km east; and Potton Hall Fields, Westleton SSSI located approximately 4.4km north-east.

12.3.16. There are six non-statutory designated CWS within 2km of the proposed highways improvements; all located between 900m to 2km. These being: Minsmere Valley Reckford Bridge to Beveriche Manor CWS; Minsmere Valley Eastbridge to Reckford Bridge CWS; Darsham Marshes CWS (which is also a Suffolk Wildlife Trust reserve); Suffolk Coastal 212 CWS (which is also a Roadside Nature Reserve Number 102); Kiln Grove and Meadow CWS; and Theberton Woods CWS.

12.3.17. The proposed highways improvements are largely within areas of public highway associated with the B1122 and the Mill Street junction. The site boundary also encompasses: an arable field, hedgerow and area of rough grassland on the northern side of the B1122 (identified as a potential construction compound); a hedgerow and strip of arable field on the southern side of the B1122; and a tree and area of garden planting at the Mill Street junction. There is a watercourse adjacent to the northern boundary of the site and a pond is present to the west.

[1] Great crested newt is a European Protected Species (EPS), receiving protection under the Conservation of Habitats and Species Regulations (2017) (Ref. 12.3.2). They are also protected under the Wildlife and Countryside Act 1981 (Ref. 12.3.3) and are a species of Principal Importance for the conservation of biodiversity in England, as listed under section 41 of the NERC Act (2006).

[2] All UK species of reptiles are protected under the Wildlife and Countryside Act 1981, making it an offence to kill or injure these species. They are also species of Principal Importance for the conservation of biodiversity in England, as listed under section 41 of the NERC Act (2006).

[3] All wild birds, their eggs and nests are protected under section 1 of the Wildlife and Countryside Act 1981.

[4] All species of bat in the UK are EPSs, receiving protection under the Conservation of Habitats and Species Regulations (2017). They are also protected under the Wildlife and Countryside Act 1981. Several bat species, including soprano pipistrelle, brown long-eared bat, noctule and barbastelle bat are species of Principal Importance for the conservation of biodiversity in England, as listed under section 41 of the NERC Act (2006). Barbastelle bats are also listed in the European Commission (EC) Habitats Directive (1992) (Ref. 12.3.4, Annex II), requiring the establishment of SACs to conserve this species.

[5] Otter is an EPS on Schedule 2 of the Conservation of Habitats and Species Regulations (2010) (Ref. 12.3.5) and protected under Schedule 5 and 6 of the Wildlife and Countryside Act 1981 and is included within section 41 of the NERC Act (2006).

[6] Water vole is protected under Schedule 5 of the Wildlife and Countryside Act 1981 and is a species of Principal Importance for the conservation of biodiversity in England, as listed under section 41 of the NERC Act (2006).

[7] Badgers are protected under the Protection of Badgers Act (1992) (Ref. 12.3.6).

12.3.18. Habitats in the wider area include arable fields, hedgerows, blocks of woodland, coastal and grazing marsh associated with the surrounding watercourses, and ponds. Deciduous woodland, hedgerows, ponds and grazing marsh are habitats of principal importance.

12.3.19. A number of notable invertebrate species have been recorded in the wider area. Habitats within the B1122 highways improvements are unlikely to be of particular importance to invertebrates, or of sufficient size to support significant numbers of notable invertebrates.

12.3.20. There are no records of great crested newts from within 500m of the proposed B1122 highways improvements but there are records, however, from a pond approximately 600m to the west. There are approximately nine ponds within 500m of the proposals, including one adjacent which could potentially support great crested newts. Habitats such as the field margins, rough grassland and hedgerows provide suitable habitat for the terrestrial phase of the species, including potential hibernation sites, and aid connectivity to the wider landscape.

12.3.21. The existing carriageway areas are unsuitable for reptiles. Rough grassland and field margins could provide suitable foraging habitat for a small number of reptiles, and there are records of common reptile species in the wider area. Given the very limited extent of suitable habitat within the footprint of the proposals, such habitats are unlikely to be of particular value to reptiles.

12.3.22. Breeding birds typical of agricultural habitats, woodland and hedgerows are likely to be present.

12.3.23. Serotine, Daubenton's bat (*Myotis daubentonii*), Natterer's bat, noctule, common and soprano pipistrelle bats, and brown long-eared bat have been recorded in the wider area, with records of both roosts and foraging activity. In addition, there are three records of the rare barbastelle from the Leiston area to the south, the closest of which is from a location approximately 4km away. This species is also present within the Sizewell C main development site, approximately 2km east. Linear features such as hedgerows will be of value to foraging and commuting bats. Mature trees are likely to be of value to roosting bats, as are buildings in close proximity to the proposed improvement works. Habitats and features along and within proximity of the proposed improvement works could be of value to a number of bat species, including barbastelle. No statutory designated site within 10km cites bats as a designated interest feature.

12.3.24. There are records of otter from within the wider area, predominantly from the Minsmere Valley. Whilst otters may travel along the small watercourse adjacent to the site, this watercourse is unlikely to be of particular value to otters.

12.3.25. There is a record of water vole from the ditch adjacent to the site.

12.3.26. Badgers are common and widespread in the area. While suitable habitat within the site boundary is limited, badger setts could be located within or close to the proposed works.

b) Environmental design and embedded mitigation

12.3.27. A summary of the measures that have been incorporated into the design of the highways improvements that will protect the existing features of ecological interest are set out below.

i) Construction

- The proposed highways improvements would not require land take from any statutory or non-statutory designated sites, and no works are proposed to Glevering Bridge or the River Deben CWS.
- Hedgerows would be retained where possible and mitigation for the loss of any valuable habitats would be incorporated into the design wherever possible.
- Temporary access routes and site compounds would be located to avoid sensitive habitats.
- The Construction Environmental Management Plan (CEMP) would define any ecological constraints and specify any measures required during construction in relation to the presence of protected species and any required vegetation clearance works. It would specify the need for an Ecological Clerk of Works (ECoW) to undertake and oversee specific tasks.
- Temporary construction lighting would be designed to minimise light-spill into adjacent habitats. This would reduce impacts on nocturnal species such as bats that may use nearby habitats for roosting or foraging.
- For both the Mill Street and Wickham Market highway improvements, a buffer zone would be maintained between the works and the adjacent watercourse in order to avoid impacts on water voles and otters.

ii) Operation

12.3.28. No embedded mitigation measures would be required during operation.

c) Preliminary assessment of effects

12.3.29. Significant effects on designated sites, plants and habitats, invertebrates, reptiles, breeding birds, otters, water voles and badgers are not anticipated and they are not discussed further in this section of the PEI. A detailed impact assessment would be presented for these habitats and species within the ES, and further details of the embedded mitigation required to offset any significant effects would also be described.

12.3.30. Significant effects on great crested newts and roosting bats are possible. A preliminary assessment of effects on these species is provided here.

i) Construction

12.3.31. Waterbodies in the vicinity of the proposed B1122 highways improvements are known to support breeding great crested newts. No ponds would be lost as a result of the proposals; however, some areas of suitable terrestrial habitat within the site would be lost, potentially resulting in injury or mortality of great crested newts and loss of resting places. There is the potential for a significant adverse effect if the ponds and related terrestrial habitats are important for great crested newts.

12.3.32. Existing bat populations are already habituated to noise and lighting levels associated with the existing traffic on the B1122. Given the small scale and discrete nature of the proposed highways improvements no significant effects arising from noise and lighting are anticipated. The proposals, however, could potentially impact bat roosts through the loss of individual mature trees. If any bat roosts would be lost due to the proposed highways improvements, this could have a significant adverse effect (depending on the status of any roost).

ii) Operation

12.3.33. No significant operational effects are envisaged given these are minor improvements to an existing road.

d) Additional mitigation and monitoring

12.3.34. The assessment has identified the potential for significant effects to occur if great crested newts or bats are present, despite the embedded mitigation measures. As such, additional mitigation measures may be required to minimise impacts so that a significant effect would be avoided. Furthermore, additional mitigation measures may also be required in relation to habitats and species for which a significant effect is not anticipated, but which are nonetheless legally protected, to ensure compliance with legislation. Under the CEMP, pre-construction surveys will be required and may result in mitigation measures such as micro-siting of specific elements of the project and/or licences for protected species. Monitoring of mitigation measures may also be required to ensure its effectiveness. These measures would be presented in the ES, if relevant.

e) Preliminary assessment of residual effects

12.3.35. Significant residual effects are not envisaged, given these would be minor improvements to an existing road.

f) Completing the assessment

12.3.36. To inform the development of appropriate mitigation measures and complete the ES, an extended Phase 1 habitat survey would be undertaken for sites of the proposed highways improvements. The focus of the surveys would be to identify any ecological constraints, such as the presence of legally protected species, particularly bats and great crested newts.

12.3.37. Once the surveys have been completed, the detailed ecological assessment for the ES would then be progressed, clarifying whether significant adverse effects are likely, particularly in respect of great crested newts and bats. Any further embedded mitigation measures which would be required to mitigate these effects would also be defined and incorporated into the design.

12.4. Amenity and recreation

12.4.1. The figures for amenity and recreation are presented in **Volume 3** as **Figures 12.4.1** to **12.4.4**.

a) Baseline environment

i) Wickham Market highway improvements

12.4.2. Amenity and recreation resources within the 1km study area comprise PRoWs passing through the rural landscape, as shown on **Figure 12.4.1**. Three bridleways join or lie within a few metres of the B1122; E-288/001/0 within the central section of the road, and E-288/012/0 and E-288/013/0 towards its eastern end.

12.4.3. There are other recreational resources within the 1km study area around the site but the proposed development is unlikely to be perceptible from these.

ii) Mill Street improvements

12.4.4. Amenity and recreation resources within the 1km study area comprise PRoWs passing through the rural landscape, and an area of registered common land as shown on **Figure 12.4.2**. There are no resources within or adjoining the site boundary.

12.4.5. The resources with the greatest potential for effects are footpaths E-396/009/0 and E-396/011/0 which extend across fields to the north of Mill Street, and E-396/017/0 and E-396/023/0 which extend along field boundaries and tracks to the west and south of the site. There are other recreational resources within the 1km study area around the site but the proposed development is unlikely to be perceptible from these.

iii) A12/A144 junction improvements

12.4.6. Amenity and recreation resources within the 1km study area comprise PRoWs and a Sustrans link to a National Cycle Route passing through the rural landscape, as shown on **Figure 12.4.3**. There are no resources within or adjoining the site boundary.

12.4.7. The resources with the greatest potential for effects are footpaths E-216/004/0 to the south and E-517/009/0 to the north, which both extend along field boundaries from the A12. There are other recreational resources within the 1km study area around the site but the proposed development is unlikely to be perceptible from these.

iv) A1094/B1069 junction improvements

12.4.8. Amenity and recreation resources within the 1km study area comprise PRoWs, two recreational routes (Suffolk Coast Path and Sandlings Walk) and Sustrans Regional Cycle Route 42/Suffolk Coastal Cycle Route passing through the rural landscape, as shown on **Figure 12.4.4**.

12.4.9. The resources with the greatest potential for effects are footpath E-354/026/0 that lies adjacent to the site boundary towards the western end of the site and bridleway E-260/003/A which joins the site boundary to the south of the site. There are other recreational resources within the 1km study area around the site but the proposed development is unlikely to be perceptible from these.

b) Environmental design and embedded mitigation

12.4.10. Existing trees and hedgerows adjoining the boundaries of the sites would be retained where possible. Measures to minimise noise and changes to air quality would be implemented as described in **Noise and vibration, section 12.7**.

c) Preliminary assessment of effects

12.4.11. People using recreational resources may experience changes to views and noise levels but are unlikely to experience changes to air quality caused by the proposed development.

i) Construction

12.4.12. The works proposed to the four sites are unlikely to involve any diversions of PRoWs and would be set within the existing presence of road infrastructure. Visibility of construction works would be limited and, as described in **Landscape and visual, section 12.2**, given the temporary duration of these effects, they are unlikely to be significant. Effects due to changes in noise during construction would also be limited and temporary (see **Noise and vibration, section 12.7**).

12.4.13. Effects on amenity and recreation receptors are unlikely to be significant.

ii) Operation

12.4.14. For users of recreational routes in the vicinity of the proposed highway improvements, there would be localised effects where noted. Any changes to views and noise would not be significant and would be in the context of views and noise from existing highways infrastructure.

- Wickham Market highway improvements – there are likely to be small changes to views and noise immediately adjacent to the road from the southern end of bridleway E-288/001/0 and the northern end of bridleway E-288/013/0.
- Improvements to Mill Street on the B1122 – effects on users of amenity and recreation resources are likely to be very limited.
- Improvements to the junction of the A12 and A144 near Darsham – effects on users of amenity and recreation resources are likely to be very limited.
- Improvements to the junction of the A1094 and B1069 near Knodishall – from the northern end of bridleway E-260/003/A there are likely to be small changes to views and noise immediately adjacent to the road.

12.4.15. None of these changes are likely to result in significant effects.

d) Additional mitigation and monitoring

12.4.16. No additional mitigation is proposed.

e) Preliminary assessment of residual effects

12.4.17. No significant residual effects are expected during the construction or operational phases of the highways improvements.

f) Completing the assessment

12.4.18. The ES would present a full amenity and recreation impact assessment underpinning the conclusions drawn above in relation to significant effects, updated where relevant to account for any design changes.

12.5. Terrestrial historic environment

a) Wickham Market highway improvements

12.5.1. The majority of works undertaken as part of the Wickham Market highway improvements, comprising minor road widening and increased corner radii, construction of passing places and enhanced drainage would be of very limited extent and would largely be within the highway boundary where a certain degree of previous disturbance can be expected. Therefore, it is unlikely that any adverse effects would arise. Where disturbance of archaeological remains is predicted, this would be of limited magnitude and could readily be mitigated by recording.

12.5.2. A review of designated heritage data held by Historic England within the vicinity of the highways improvements was undertaken. In addition, the Desk Based Assessment for the Wickham Market park and ride scheme was reviewed for information about non-designated assets which fall within the junction of Easton Road and the B1116 where approximately 0.3 hectares (ha) of land take beyond the existing highways boundary would be required to allow for remodelling of the junction to provide improved visibility.

12.5.3. The only designated heritage asset within the site boundary is the Grade II listed Glevering Bridge (LB 1199397/103833), although the Grade II listed Valley Farmhouse (LB 1198389) and building to the rear of Valley Farmhouse (NHLE 1030832), Valley Cottage (LB1030831) and Glevering Mill (LB1030555) are close to the site boundary. No works to Glevering Bridge are proposed and no designated heritage assets would be directly affected by these works.

12.5.4. The Valley Road/B1116 junction is located within an area of higher archaeological potential, being adjacent to the Historic Environment Record for the Lower Hacheston Roman small town that was partially investigated during the archaeological geophysical survey and evaluation carried out on the Wickham Market park and ride site. It appears that the main focus of this heritage asset was to the east of the proposed junction, and while the exact extent and nature of any archaeological features to the west of the modern B1116 is uncertain, it is likely that the proposed Easton Road junction is located in an area formerly occupied by features related to the small town, such as field systems. These features are likely to be of archaeological interest but any adverse effects could be effectively mitigated by archaeological investigation and recording, to a scope to be agreed with Suffolk County Council Archaeological Service. Following this, it is not anticipated that any significant adverse residual effects would remain.

12.5.5. Change to setting of designated heritage assets during construction would be very limited as a result of the very constrained views and the limited scope and duration of the works. These effects would reduce further on completion of the works and no lasting change to setting of any designated heritage assets is predicted to arise.

b) Improvements at Mill Street, A12/A144 junction and A1094/B1069 junction

12.5.6. The other highways improvement works would be of very limited extent and would be within the highway boundary where a certain degree of previous disturbance can be expected. It is therefore unlikely that any adverse effects would arise. Where disturbance of archaeological remains is predicted, this would be of limited magnitude and could readily be mitigated by recording.

12.5.7. Change to setting of designated heritage assets during construction would be very limited as a result of the limited scope and duration of the works. These effects would reduce further on completion of the works. No lasting change to setting of any designated heritage assets is anticipated except where highways improvements are located within a conservation area or adjacent to a designated heritage asset such as a listed building where there is a potential for adverse change to setting. Even in these cases, effects are unlikely to be significant and mitigation could be achieved through detailed design.

12.5.8. It is not anticipated that any significant adverse effects would arise, although further work will be required to establish the need for any additional archaeological mitigation of intrusive construction works. More detailed assessment would be presented in the ES, but it is not anticipated that any significant adverse effects would arise.

12.6. Soils and agriculture

12.6.1. The figures for soils and agriculture are presented in **Volume 3** as **Figures 12.6.1** to **12.6.16**.

a) Baseline environment

i) Wickham Market highway improvements

12.6.2. The site is underlain by an area mapped as the Crag Group (quaternary sand), with an overlying drift deposit of glacial outwash of the Lowestoft Formation, comprising sands and gravels (Ref. 12.6.1) and alluvium within the River Deben floodplain.

12.6.3. Across the majority of the road improvement site the soils are mapped as being slightly acidic loamy and clayey soils with impeded drainage except where the road runs close to and crosses the River Deben floodplain and close to the junction with the B1078 (**Figure 12.6.1**). The floodplain soils are described as being loamy and clayey floodplain soils with naturally high groundwater. The soils close to the junction with the B1078 are described as being slowly permeable, seasonally wet, slightly acidic but base-rich loamy and clayey soils.

12.6.4. Land within the River Deben floodplain is shown as being Grade 4 with a small area of Grade 2 land close to the junction of the road improvement scheme with the B1078 (**Figure 12.6.2**). The remainder of the land is mapped as Grade 3 agricultural land.

12.6.5. Based on the provisional mapping, the extent of land under each grade is as follows (noting that once detailed plans are available it will be possible to confirm the extent of existing highway within these areas).

Table 12.6.1 Agricultural Land Classification (ALC) grade distribution

ALC Grade	Area (ha)
Grade 2	0.81
Grade 3 (undifferentiated)*	2.30
Grade 4	1.32
Total	**4.44**

*Based on available provisional ALC maps

12.6.6. There is no detailed ALC mapping available for this site.

12.6.7. None of the proposed development area includes land under an agri-environment or forestry scheme (**Figures 12.6.3** and **12.6.4**), although land immediately adjacent to sections is under Entry Level plus Higher Level Stewardship which also includes a felling licence application.

ii) Improvements at Mill Street

12.6.8. The site is underlain by an area mapped as the Crag Group (quaternary sand and gravel), with an overlying drift deposit of glacial outwash of the Lowestoft Formation, comprising sands and gravels.

12.6.9. The soils (**Figure 12.6.5**) are described as being freely draining slightly acidic but base-rich soils (Ref. 12.6.2). These soils belong to the Melford Soil Association (representing a group of soil types which are typically found occurring together in the landscape). Land use on these soils is typically arable, comprising cereals, sugar beet and other crops.

12.6.10. Published ALC maps (Ref. 12.6.3; **Figure 12.6.6**) show the site to comprise predominantly Grade 3 land with a small amount of Grade 2 land at the western end.

12.6.11. Under the ALC system land is graded between Grade 1 and 5, with Grade 3 subdivided into 3a and 3b. Land in grades 1, 2 and 3a is considered to be 'best and most versatile' land.

12.6.12. Based on the provisional mapping, the extent of land under each grade is as follows (noting that once detailed plans are available it will be possible to confirm the extent of existing highway within these areas).

Table 12.6.2 Agricultural Land Classification grade distribution

ALC Grade	Area (ha)
Grade 2	0.05
Grade 3 (undifferentiated)*	0.86
Total	**0.91**

*Based on available provisional ALC maps

12.6.13. There is no detailed ALC mapping available for this location.

12.6.14. None of the land is under an agri-environment or forestry scheme (**Figures 12.6.7** and **12.6.8**).

iii) Improvements at the A12/A144 junction

12.6.15. The site is underlain by an area mapped as the Crag Group (quaternary sand). No overlying drift deposits are mapped in this location.

12.6.16. The soils on all the sites (**Figure 12.6.9**) are described as being slowly permeable, seasonally wet slightly acidic but base-rich loamy and clayey soils. Land use on these soils is typically arable.

12.6.17. Published ALC maps (**Figure 12.6.10**) show the site to comprise Grade 3 agricultural land.

12.6.18. Under the ALC system land is graded between Grade 1 and 5, with Grade 3 subdivided into 3a and 3b. Land in grades 1, 2 and 3a is considered to be 'best and most versatile' land.

12.6.19. Based on the provisional mapping, the extent of land under each grade is as follows (noting that once detailed plans are available it will be possible to confirm the extent of existing highway within these areas).

Table 12.6.3 Agricultural Land Classification grade distribution

ALC Grade	Area (ha)
Grade 3 (undifferentiated)*	0.99
Total	**0.99**

*Based on available provisional ALC maps

12.6.20. There is no detailed ALC mapping available for this location.

12.6.21. Land to the east of the junction is under an entry-level plus higher-level agri-environment scheme (**Figure 12.6.11**). Land to the south-west of the junction is under an entry-level agri-environment scheme. None of the land is under a woodland or forestry scheme (**Figure 12.6.12**).

iv) Improvements at the A1094/B1069 junction

12.6.22. The site is underlain by an area mapped as the Chillesford Church Sand Member, with, in places, an overlying drift deposit of glacial outwash of the Lowestoft formation, comprising sands and gravels.

12.6.23. The soils on all the sites (**Figure 12.6.13**) are described as being freely draining slightly acidic sandy soils. Land use on these soils is typically arable.

12.6.24. Published ALC maps (**Figure 12.6.14**) show the site to comprise Grade 4 agricultural land.

12.6.25. Under the ALC system land is graded between Grade 1 and 5, with Grade 3 subdivided into 3a and 3b. Land in grades 1, 2 and 3a is considered to be 'best and most versatile' land.

12.6.26. Based on the provisional mapping, the extent of land under each grade is as follows (noting that once detailed plans are available it will be possible to confirm the extent of existing highway within these areas).

Table 12.6.4 Agricultural Land Classification grade distribution

ALC Grade	Area (ha)
Grade 4	1.25
Total	**1.25**

*Based on available provisional ALC maps

12.6.27. There is no detailed ALC mapping available for these sites.

12.6.28. Land immediately south of the junction is under an entry-level plus higher-level agri-environment scheme (**Figure 12.6.15**). None of the land is under a woodland or forestry scheme (**Figure 12.6.16**).

b) Environmental design and embedded mitigation

12.6.29. A summary of the measures that have been incorporated into the design of the proposed highway improvements and that would protect the existing features of soil and agricultural interest, where these are likely to be impacted, is set out below.

i) Construction

12.6.30. The sustainable re-use of the soil resource would be undertaken in line with the Construction Code of Practice for the Sustainable Use of Soil on Construction Sites (Ref. 12.6.4). Measures which would be implemented include (but are not limited to):

- protect stockpiles from erosion and tracking over; and
- ensure physical condition of the entire replaced soil profile is sufficient for the post-construction use.

12.6.31. All soils would be stored away from watercourses (or potential pathways to watercourses) and any potentially contaminated soil would be stored on an impermeable surface and covered to reduce leachate generation and potential migration to surface waters. Contaminated soil would be tested and removed from site and disposed at a licenced facility as appropriate.

12.6.32. Following completion of construction operations all agricultural land taken temporarily would be fully reinstated as near as practically possible to its former condition.

12.6.33. Industry standard measures would be put in place to control pollution, including from fuel or chemical stores, silt-laden run-off or dust.

12.6.34. A considerate construction approach would be used to minimise potential impacts on the remainder of the landholding and on neighbouring landholdings during the construction phase. Toolbox talks would be used to inform all those working on the site of the requirements for soil handling and minimisation of disturbance to agricultural activities.

12.6.35. All fencing around the proposed development would be sufficient to resist damage by livestock and will be regularly checked and maintained in a suitable condition. Any damage to boundary fencing would be repaired immediately.

12.6.36. Measures contained in relevant Defra and Environment Agency best practice guidance (Ref. 12.6.5) on the control and removal of invasive weed species would be implemented where appropriate.

12.6.37. Works would cease, and the Animal Health Regional Office would be advised, should animal bones be discovered which indicate a potential burial site.

12.6.38. All movement of plant and vehicles between fields would cease in the event of a disease outbreak and official Defra advice would be followed to minimise the biosecurity risk associated with the continuation of works.

12.6.39. In relation to temporary and permanent land take requirements EDF Energy would liaise with landowners to understand and where possible address their concerns.

ii) Operation

12.6.40. There would be no additional mitigation measures throughout the operational phase.

c) Preliminary assessment of effects

i) Construction

12.6.41. The proposals would result in the loss of approximately 7.59ha of primary agricultural land, a small proportion of this land has the potential to be best and most versatile agricultural land. Any temporary land take would be restored to agricultural use.

12.6.42. Given the potential that some best and most versatile land is to be lost, this preliminary assessment considers that this would be a significant temporary effect.

12.6.43. There could also be an impact on the agricultural enterprise because of the loss of a proportion of the productive land. This would be assessed on a case by case basis as required.

12.6.44. On the assumption that landowners' concerns are addressed, through appropriate mitigation, this preliminary environmental assessment considers that significant effects on the agricultural enterprise are unlikely to occur and so are not considered further.

ii) Operation

12.6.45. There would be no additional operational phase effects on the soil resource or agricultural enterprises.

d) Additional mitigation and monitoring

12.6.46. There are no mitigation measures available for the loss of best and most versatile land.

e) Preliminary assessment of residual effects

12.6.47. The embedded mitigation measures would ensure that the potential for significant effects is removed with the exception of the permanent loss of agricultural land. However, the majority of the best and most versatile land would be associated with the temporary construction compound and thus the effect would be temporary, and the land would be returned to agriculture post-construction.

f) Completing the assessment

12.6.48. Once the proposals for the development as a whole are finalised, a full assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

12.7. Noise and vibration

a) Baseline environment

12.7.1. Baseline survey work has yet to be undertaken for the other highway improvements. However, a preliminary consideration of the noise and vibration impact may be made without reference to existing baseline values. The following preliminary assessment is relevant to each of the four highway improvements considered in this chapter unless otherwise stated.

b) Environmental design and embedded mitigation

i) Construction

12.7.2. The standard of good practice outlined in 'British Standard BS5228-1 Noise: 2009 + A1 2014 – Code of Practice for noise and vibration control at open construction sites' (Ref. 12.7.1), would be followed. Embedded mitigation for the control of noise and vibration could include, but not be restricted to the following measures:

- selection of quiet plant and techniques in accordance with good practice in BS5228 for all construction, demolition and earth moving activities;
- switching off equipment when not required;
- use of reversing alarms that ensure proper warning whilst minimising noise impacts off-site;
- provision of training and instruction to construction site staff on methods and techniques of working to minimise off-site noise and vibration impacts; and
- all construction work would take place only during Monday to Friday 07:00 to 19:00 hours and Saturday 07:00 to 13:00 hours.

12.7.3. With respect to vibration, BS 5228-2 gives detailed advice on standard good construction practice for minimising impacts from construction vibration. It is expected it would be a requirement of the contractors to adhere to this guidance and set out in the Code of Construction Practice.

12.7.4. EDF Energy would also have a system for the receipt and recording of any noise or vibration complaints from occupiers of noise sensitive receptors, and procedures for investigating and acting appropriately as necessary upon those complaints.

ii) Operation

12.7.5. Finished road surfaces would be in good condition and thus would reduce noise and vibration which may occur where existing road surfaces are uneven.

c) Preliminary assessment of effects

12.7.6. Noise and vibration levels have been predicted by calculation and modelling. A "significant" effect has been identified where levels are predicted to exceed a specified threshold value. Appropriate threshold levels are based on various standards and a relevant guidance and depend on the type of source; the sensitivity of the receptors; the time of day when it might occur; and, in some situations, on the existing noise levels in the area.

i) Construction

12.7.7. A detailed analysis of noise and vibration impacts has not yet been carried out, however an initial overview of likely working techniques has enabled some initial high level conclusions to be drawn for each highway improvement. It is assumed that no noisy construction work would take place at night.

12.7.8. For the Wickham Market highway improvements, the following premises would be likely to experience a significant noise effect when construction activity takes place adjacent to their boundaries: Valley Farm, Valley Farm Cottages (in part of the garden), Windy Ridge (in part of the garden), Golf Course and The Lodge.

12.7.9. For the proposed highway improvements at the junction of Mill Street and the B1122 the following premises would be likely to experience a significant noise effect when construction activity takes place adjacent to their boundaries: Gardenhouse Farm, Moles Meadow, Pine Tree Cottage, Mill Lodge, Stillwater, Linden.

12.7.10. For the proposed highway improvements at the junction of the A144 and the A12, residential premises within 70m of construction activity may experience significant noise effects.

12.7.11. For the proposed highway improvements at the junction of the A1094 and the B1069, West Lodge is likely to experience a significant noise effect during construction.

12.7.12. Noise and vibration levels at other receptors during construction are unlikely to lead to significant adverse effects, although this would need to be confirmed once further information about the likely working methods becomes available.

ii) Operation

12.7.13. Noise and vibration would not be likely to have a significant adverse effect at any receptors during the operational phase as these are existing roads with existing traffic usage.

d) Additional mitigation and monitoring

i) Construction

12.7.14. It is anticipated that some localised screening using portable acoustic panels would be possible around some affected noise sensitive receptors. This may not be possible in all situations due to space constraints. Further work would be needed to consider this.

ii) Operation

12.7.15. No additional mitigation would be required for the operational phase.

iii) Monitoring

12.7.16. Routine monitoring would be carried during construction to a scheme to be agreed with local authorities. Provision would be made as necessary for monitoring of noise and vibration levels in the event of complaints being received from occupiers of noise sensitive receptors, or on request of the local authorities.

e) Preliminary assessment of residual effects

i) Construction

12.7.17. There is insufficient information available at this stage to enable a robust prediction of the effectiveness of mitigation to be made. However, it is possible to estimate the likely outcomes which might result from the introduction of screening around construction areas in some areas. Significant noise effects may arise from road planning, excavators, breakers, bulldozers, vibratory compactors, tipper lorries and kerb cutters, although not all of these sources are likely to be present at all sites.

12.7.18. With mitigation in place, some significant, short-term effect from noise for the duration of the local works is possible at Valley Farm and for part of the Golf Course during the Wickham Market highway improvements.

12.7.19. With mitigation in place, some significant, short-term effect from noise is possible for approximately 30% of the construction programme at Moles Meadow and Pine Tree Cottage. This would occur during highway improvement work on the B1122.

12.7.20. With mitigation in place, some significant, short-term noise effect remains possible throughout the duration of the works at noise sensitive receptors within 50m of the boundary of the construction work for the A144/A12 junction.

12.7.21. With mitigation in place, it is possible that some significant, short-term noise effect would occur at West Lodge for approximately 25% of the duration of the highway improvement work at the junction of the A1094 and the B1069.

12.7.22. At all other receptors, with mitigation in place, noise and vibration effects are unlikely to be significant.

ii) Operation

12.7.23. Noise and vibration effects during the operation of the highways improvements would not be significant.

f) Completing the assessment

12.7.24. Further assessment of effects will be undertaken as part of the ongoing EIA. The ES would present a full noise and vibration assessment and would consider any new information such as amended design or construction methodologies which might be relevant, although it is anticipated that the assessment would support the preliminary conclusions drawn above.

12.8. Geology and land quality

a) Baseline environment

12.8.1. The baseline below is relevant to each of the four locations of the proposed highways improvements unless otherwise specified.

i) Geology

12.8.2. The following provides a summary of the geology and geological characteristics within the local area:

- made ground: potentially present, related to construction of existing road, historical activities, and farmers' tips;
- superficial deposits: Lowestoft Formation, alluvium and head deposits;
- bedrock: the Crag Group, and the Chillesford Church Sand Member;
- mining and quarrying: small scale historical sand and gravel pits in the local area; and
- unexploded ordnance (UXO) risks: low risk.

ii) Hydrology and hydrogeology

12.8.3. The following provides a summary of the hydrological and hydrogeological characteristics within the local area:

- surface water features: several water features including River Deben, tributaries of the Minsmere New Cut River and small ponds are present in the local area;
- superficial aquifer: the Lowestoft Formation is classified as a Secondary (Undifferentiated) Aquifer and the head deposits are classified as a Secondary A Aquifer;
- bedrock aquifer: the Crag Group and the Chillesford Church Sand Member are both classified as Principal Aquifers; and
- groundwater vulnerability: the local area contains soils of low, intermediate and high leaching potential.

iii) Site history

12.8.4. The Leiston Road (B1122) and surrounding agricultural land extends back to the 19th century at least. The surrounding area has also been predominantly used as agricultural land.

12.8.5. The local network of roads is also likely to have been present since the 19th century with minimal historical contaminative uses in the local area.

iv) Key hazards

12.8.6. Key hazards present within the local area include the following:

- made Ground (on-site and off-site) associated with current and former land uses including the construction and operation of the local roads, former sand and gravel pits and other activities; and
- farm land within the local area and the potential for un-mapped farmers tips.

v) Summary of Preliminary Conceptual Site Model (PCSM)

12.8.7. A summary of potential contamination sources, pathways and receptors identified within the PCSM is provided in **Table 12.8.1**.

12.8.8. Potential receptors and pathways as summarised in **Table 12.8.2**.

b) Environmental design and embedded mitigation

i) Construction

12.8.9. The CEMP would specify measures required during construction including stockpile management, dust suppression measures and appropriate and safe storage of fuel, oils and equipment during construction.

ii) Operation

12.8.10. The proposed development would be operated in accordance with the relevant regulations, good practice and pollution prevention including:

- the incorporation of petrol/oil interceptors within the drainage design where considered necessary; and
- the use of appropriate Sustainable Urban Drainage Systems (SuDS) schemes where feasible (see **Surface water, section 12.10**).

c) Preliminary assessment of effects

i) Construction

12.8.11. The construction works would potentially introduce new sources of contamination and disturb and mobilise existing sources of contamination through excavation and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off and ground gas migration pathways. With the embedded mitigation, construction activities should not increase the contamination risks presented at the site and an overall neutral effect is predicted. These effects would not be significant.

Table 12.8.1 Potential sources of contamination

Potential source of contamination	Potential contamination	Approximate location
Made ground associated with former land uses.	Ground gas and a range of inorganic and organic contaminants including the potential for asbestos.	On-site.
Farmland and potential for un-mapped farmers tips.	Contamination risk from herbicides, pesticides, silage, effluent and fuel oils. Risk of inorganic and organic contamination including metals and hydrocarbons, PCBs, asbestos, etc.	
Made ground associated with former land uses.	Ground gas and a range of inorganic and organic contaminants including the potential for asbestos.	Off-site.
Farms and the potential for un-mapped farmers tips.	Contamination risk from herbicides, pesticides, silage effluent, and fuel oil. Risk of inorganic and organic contamination.	

Table 12.8.2 Potential receptors and pathways

Receptor group	Receptor	Principal contaminant migration pathways
Human health (on-site).	Pedestrians and road users using existing and future roads, roundabout, footpaths and fields within the sites. Construction/maintenance workers.	Dermal contact with and ingestion of contaminants in soils, soil-derived dusts and water. Inhalation of soil-derived dust, fibres, gas and vapours.
Human health (off-site).	Occupants of nearby residential and commercial properties. Pedestrians accessing surrounding roads and footpaths. Agricultural workers.	Dermal contact with and ingestion of contaminants in soil-derived dusts and water that may have migrated off-site. Inhalation of soil-derived dust, fibres, gas and vapours which may have migrated off-site.
Controlled waters: groundwater (on-site and off-site).	Groundwater in Principal Bedrock Aquifer; and Secondary A and Secondary Undifferentiated Superficial Aquifer.	Leaching of contaminants in soil to groundwater in underlying aquifers. Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers. Discharge of contaminants entrained in groundwater and/or surface water run-off followed by overland flow and discharge.
Controlled waters: surface waters (off-site).	Local surface watercourses including tributaries of the Minsmere New Cut River and ponds within the local area.	
Property (on-site and off-site).	Existing on-site services and structures on and off-site. Proposed on-site services and structures.	Direct contact of contaminants in soil and/or groundwater with existing and proposed structures and buried services. Migration of contaminated groundwater, ground gas and/or vapours along strata and preferential pathways such as service routes or differentially permeable strata.
	Crops and livestock.	Direct contact, ingestion, inhalation and uptake of soil and water contamination by crops and/or livestock. Migration of contaminated waters/dust/fibres and subsequent uptake by crops or ingestion/inhalation/dermal contact by livestock.

12.8.12. A preliminary assessment of the effects during the construction phase is summarised in **Table 12.8.3**.

ii) Operation

12.8.13. The operational phase would potentially introduce new sources of contamination. Spillages and leaks may occur creating additional potential pathways for the migration of potential contamination that were not present at baseline. With embedded mitigation an overall neutral effect is anticipated. These effects would not be significant.

12.8.14. Effects during the operational phase are summarised in **Table 12.8.4**.

d) Additional mitigation and monitoring

12.8.15. The preliminary assessment of effects presented above identifies no adverse significant effects during construction and operation in relation to land quality. Additional measures to mitigate significant adverse effects are not therefore required.

e) Preliminary assessment of residual effects

12.8.16. No additional mitigation is proposed beyond the embedded measures described above and the residual effects for all phases of development would remain the same as those described above in the preliminary assessment of effects. The effects would be neutral and would not be significant.

f) Completing the assessment

12.8.17. Once the proposals for the Sizewell C project development as a whole are finalised, an assessment of the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

Table 12.8.3 Construction phase effects for the proposed development

Receptor	Value/Sensitivity	Baseline risk	Construction risk	Effect
Human	High	Very low	Very low	Not significant
Controlled waters (groundwater).	Medium	Low	Very low	Not significant
Controlled waters (surface water).	High	Very low	Very low	Not significant
Property (existing and future structures and services).	Low	Very low	Very low	Not significant
Property (crops and livestock).	Medium	Very low	Very low	Not significant

Table 12.8.4 Operational phase effects for the proposed development

Receptor	Value/Sensitivity	Baseline risk	Construction risk	Effect
Human	High	Very low	Very low	Not significant
Controlled waters (groundwater).	Medium	Low	Very low	Not significant
Controlled waters (surface water).	High	Very low	Very low	Not significant
Property (existing and future structures and services).	Low	Very low	Very low	Not significant
Property (crops and livestock).	Medium	Very low	Very low	Not significant

12.9. Groundwater

a) Baseline environment

12.9.1. Details on the geology of the highway improvement sites are provided in **Geology and land quality, section 12.8**.

12.9.2. The Lowestoft Formation diamicton (where present) is classified as a Secondary Aquifer (undifferentiated)[8]. The Lowestoft Formation Sand and Gravels are classified as a Secondary A Aquifer[9] (Ref. 12.9.1).

12.9.3. The Crag Group, Newhaven Chalk Formation and Chillesford Church Sand Member bedrock are classified as Principal Aquifers[10].

12.9.4. The Junction of B1119 and A12 is within a Zone 2[11] Groundwater Source Protection Zone (SPZ)[12]. The Inner Zone (Zone 1[13]) is located approximately 300m south-east of the site. The Junction of B1079 and B1078 is within a Zone 3[14] Groundwater SPZ. There are no SPZs located within 1km of the other sites.

12.9.5. Current groundwater levels at the site are not known. Contours shown on British Geological Survey (BGS) hydrogeological mapping (Ref. 12.9.2) suggest that Crag groundwater levels at the sites may be between 5m and 7m Above Ordnance Datum (AOD). There are no historic groundwater levels mapped for the Chillesford Church Sand Member. The hydrogeological maps suggest that groundwater in the Newhaven Chalk Formation is approximately 28m AOD. These contours are based on data from 1976 and are only indicative of current levels; however the hydrogeological regime is not considered likely to have changed significantly in the intervening years.

12.9.6. A groundwater abstraction is likely to be located 300m south-east of the B1119 and A12 junction, coincident with the SPZ.

12.9.7. All sites are located on the Waveney and East Suffolk Chalk and Crag groundwater body (Water Framework Directive reference GB40501G400600) (Ref. 12.9.3). This groundwater body has been classified by the Environment Agency as being of Poor Quantitative and Poor Chemical status, with an objective to being of Good Quantitative and Good Chemical status by 2027. The Poor Chemical status is attributed to impacts from agriculture as evidenced by elevated nitrate concentrations in groundwater. All five sites fall within a groundwater Nitrate Vulnerable Zone.

12.9.8. Given the local geology and depth to groundwater it is not considered that there is a connection between groundwater and surrounding surface water features. This is discussed further in **Surface water, section 12.10**.

12.9.9. The Suffolk Coastal and Waveney District Strategic Flood Risk Assessment (SFRA) makes no reference to groundwater flooding across the Suffolk Coastal and Waveney District (Ref. 12.9.4), see also **Flood risk, section 12.11**.

12.9.10. It is understood that there is no known existing land contamination on the site (see also **Geology and land quality, section 12.8**).

b) Environmental design and embedded mitigation

i) Construction

12.9.11. It is proposed that construction drainage will be contained within the site, with drainage to ground.

12.9.12. A piling risk assessment in accordance with Environment Agency guidance may be required to ensure that piling techniques deemed appropriate are implemented at the site (if piling is deemed necessary) by identifying and managing potential risks as a result of creating pathways to groundwater.

12.9.13. The CEMP would specify measures required during construction; including implementation of working methods during construction to ensure that there is no surface water run-off from the works, or any stockpiles, into adjacent surface watercourses/leaching into underlying groundwater, in accordance with best practice such as the Pollution Prevention Guideline, Working at Construction and Demolition-sites.

[8] Secondary Undifferentiated Aquifer - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

[9] Secondary A Aquifer - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

[10] Principal Aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

[11] Outer zone (Zone 2) - Defined by a 400 day travel time from a point below the water table. This zone has a minimum radius of 250 or 500 metres around the source, depending on the size of the abstraction.

[12] Groundwater Source Protection Zones are areas defined around groundwater sources used for public drinking water supply. The SPZ shows the risk of contamination from activities that might cause pollution in the area. The closer the activity, the greater the risk.

[13] Inner zone (Zone 1) - Defined as the 50-day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres.

[14] Total catchment (Zone 3) - Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment may be displaced some distance from the source. For heavily exploited aquifers, the final Source Catchment Protection Zone can be defined as the whole aquifer recharge area where the ratio of groundwater abstraction to aquifer recharge (average recharge multiplied by outcrop area) is >0.75.

12.9.14. The drainage/flood prevention strategies would consider the ground conditions including the permeability of the strata and the level of contamination present on-site.

ii) Operation

12.9.15. There is anticipated to be sufficient space within the site boundary to construct an effective drainage network, in accordance with highway authority standards, that would accommodate the highway improvements and the existing A144, A12, A1094, B1069, B1119 and B1122 roads.

12.9.16. Appropriate drainage would be used, including the incorporation of SuDS measures where appropriate.

12.9.17. Petrol/oil interceptors would be incorporated within the drainage design where considered necessary.

c) Preliminary assessment of effects

i) Construction

12.9.18. Due to the shallow excavation depths anticipated at each location, the construction phase of the development is unlikely to have an impact on the groundwater level and flow regime.

12.9.19. Where a spill or leak does occur during construction the impact on groundwater within superficial deposits would be low. The effect of this impact on the Lowestoft Formation sand and gravel aquifer and on groundwater within the Lowestoft diamicton would not be significant.

12.9.20. The groundwater in Principal Aquifers would be protected from any spills or leaks where they are overlain by low permeability superficial deposits. In areas where the Principal Aquifers are overlain by sand and gravel of the Lowestoft Formation there is a potential pathway for contamination. However, given the relatively low volumes of potentially contaminative material the scale of any spill or leak would be small, hence the impact on groundwater would be low and the effect would not be significant.

12.9.21. Considering the baseline conditions of each location in combination with the environmental design and embedded mitigation there would be no significant effects at the site with respect to groundwater during construction.

ii) Operation

12.9.22. The proposed works would not significantly increase the impermeable area of ground cover at each location. Water falling onto impermeable surfaces would be channelled into existing drainage infrastructure or supplementary drainage features.

12.9.23. During operation the main risks from contamination are fuel spills or leaks from vehicles using the roundabout and adjoining roads. Contamination from these sources would be of limited magnitude and longevity and would be mitigated through drainage infrastructure.

12.9.24. Considering the baseline conditions of the site in combination with the environmental design and embedded mitigation, there would be no significant effects with respect to groundwater during operation.

d) Additional mitigation and monitoring

12.9.25. Periodic inspection and maintenance of the drainage infrastructure may be required at each location to ensure the continued efficacy of the surface water drainage system.

e) Preliminary assessment of residual effects

12.9.26. There are not expected to be any significant adverse residual effects during the construction or operational phases.

f) Completing the assessment

12.9.27. Once the proposals for the Sizewell C development as a whole are finalised, the full groundwater assessment of the proposals would be completed as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

12.10. Surface water

a) Baseline environment

i) Wickham Market highway improvements

12.10.1. The Wickham Market highway improvement works would be located in the River Deben (Brandeston Bridge – Melton) water body (water body reference GB105035046310) (Ref. 12.10.1). The River Deben in this reach flows within a floodplain that has numerous other surface water features, including drainage ditches, secondary channels and backwaters. The site boundary for the proposals crosses the River in the west of the site. Moving in an easterly direction, the site boundary initially lies to the east and then to the north of the primary river channel.

12.10.2. There are two linked surface water reservoirs in the west of the study area, a short distance upstream from Deben Mills. Light Detection and Ranging data of the site indicates that these reservoirs sit within the floodplain and connect to the River Deben.

12.10.3. Glevering Mill and Deben Mills are both within the study area. The channel modification associated with these channels characterises the rivers morphology throughout the study area. There are impounded reaches, free-flowing reaches, secondary channels, backwaters and floodplain drainage channels, all present as a consequence of the historic mills.

12.10.4. The River Deben (Brandeston Bridge-Melton) water body (water body reference GB105035046310) is designated as a heavily modified water body (HMWB). The geomorphology and the hydrological regime of the River Deben are of sufficient quality to support Good Ecological Status (GES).

12.10.5. Physico-chemical and chemical data presented on Catchment Data Explorer have been reviewed for the River Deben in the vicinity of the proposed site boundary, which indicates that the chemical status is Good.

12.10.6. Physico-chemical data indicate that the River Deben in the vicinity of the site boundary is at Good or High status for ammonia, Biochemical Oxygen Demand (BOD), dissolved oxygen (DO), pH and temperature, and are not adversely affected by pollutants such as copper, iron, zinc and various pesticides. The water body is at Moderate physico-chemical status as a result of high phosphate concentrations. This suggests that water quality in the catchment is generally good, although it is limited by high nutrient loadings from agricultural run-off and/or treated sewage effluent.

ii) Mill Street improvements

12.10.7. The road junction of the B1122 and Mill Street is located within the Minsmere Old River catchment (water body references GB105035046270) (Ref. 12.10.2). A tributary of Minsmere Old River is located to the north of the B1122. Several ponds are located to the east of the potential area for the construction compound and south of the B1122.

12.10.8. The Minsmere Old River water body (water body reference GB105035046270) is designated as a HMWB. However, the geomorphology and the hydrological regime are of sufficient quality to support GES.

12.10.9. Physico-chemical and chemical data presented on Catchment Data Explorer have been reviewed for Minsmere Old River.

12.10.10. Physico-chemical data indicate that the Minsmere Old River is at High or Good WFD status for ammonia, BOD, DO, pH and temperature. The overall ecological status of the Minsmere Old River is Moderate, due to Poor biological quality elements.

iii) A12/A144 junction improvements

12.10.11. The road junction of the A12 and A144 is located on the watershed of two adjoining river catchments; Wenhaston Watercourse and Minsmere Old River (water body references GB105035046010 and GB105035046270 respectively). Dunwich River and a tributary of Minsmere Old River are located in the vicinity of the proposed site boundary. There are also a number of surface water ponds in the vicinity of the proposed site boundary.

12.10.12. Geomorphology and hydromorphology are key factors contributing to whether a water body can achieve or maintain GES.

12.10.13. The Wenhaston Watercourse water body (water body reference GB105035046010) is not designated artificial or heavily modified. The geomorphology and the hydrological regime are of sufficient quality to support GES.

12.10.14. In contrast, Minsmere Old River water body (water body reference GB105035046270) is designated as a HMWB. However, the geomorphology and the hydrological regime are of sufficient quality to support GES.

12.10.15. Physico-chemical and chemical data presented on Catchment Data Explorer have been reviewed for Wenhaston Watercourse and Minsmere Old River.

12.10.16. Physico-chemical data indicate that the Wenhaston Watercourse is at High WFD status for ammonia, pH and temperature. Phosphate is at Poor status while DO is at Bad status. The former is likely to be due to high nutrient loadings from agricultural run-off and eutrophication processes. It is likely the overall ecological status of the Wenhaston Watercourse is Moderate due to the Poor and Bad statuses of phosphate and DO respectively.

12.10.17. Physico-chemical data indicate that the Minsmere Old River is at High or Good WFD status for ammonia, BOD, DO, pH and temperature. The overall ecological status of the Minsmere Old River is Moderate due to the 'Poor' status of biological quality elements.

iv) A1094/B1069 junction improvements

12.10.18. The road junction of the A1094 and B1069 is not located in a river catchment. There are no surface water ponds and/or drainages ditches in the vicinity of the junction.

12.10.19. The proposed improvements would therefore not have an impact on surface water and have been scoped out of this assessment.

b) Environmental design and embedded mitigation

i) Construction

12.10.20. Surface water run-off would likely be contained at the individual sites with drainage to ground wherever feasible. Intercepting site drainage and discharging to ground would prevent the supply of sediment and other contaminants to surface drainage networks during construction. Any construction phase drainage design would take account of existing patterns fluvial and surface water flood risk.

12.10.21. Petrol/oil interceptors would be incorporated within the drainage infrastructure where considered necessary.

12.10.22. Mitigation measures would be incorporated into CEMP and could include wheel washing, limits on the locations of concrete and cement mixing and washing areas and bunding for tanks containing fuels, oils, lubricants and other chemicals.

ii) Operation

12.10.23. It is anticipated there would be sufficient space within the individual site boundaries to construct (or link in with existing) effective drainage networks (in accordance with highway authority standards) that would accommodate the highway improvements and existing run-off from the affected roads. The existing road network within the Wickham Market road improvement site boundary partially lies within Flood Zone 3. The design of drainage improvements would account for this flood risk, ensuring that it does not increase flood risk on or off-site.

12.10.24. The operational drainage system would incorporate SuDS measures where appropriate, to minimise potential impacts on surface water receptors.

c) Preliminary assessment of effects

i) Construction

12.10.25. Considering both the baseline conditions of the locations and the embedded mitigation proposed, there would likely be no significant adverse effects on surface water at the sites.

ii) Operation

12.10.26. Considering both the baseline conditions of the locations and the embedded mitigation proposed, significant adverse effects on surface water at the sites are not considered likely. Incorporation of existing run-off from affected roads into the drainage design could reduce existing flood risk slightly in some areas producing a minor beneficial effect.

d) Additional mitigation and monitoring

12.10.27. Periodic inspection and maintenance of the drainage infrastructure would be required to ensure its continued efficacy.

e) Preliminary assessment of residual effects

12.10.28. It is unlikely there would be any significant adverse residual effects during the construction or operational phases.

f) Completing the assessment

12.10.29. EDF Energy anticipates that effective mitigation could be provided for the proposed developments that would minimise surface water impacts. The final design of the proposed developments, the need for mitigation and its form would be determined in liaison with the relevant authorities.

12.10.30. Once the proposals for the Sizewell C development are finalised, a full assessment of potential effects on the surface water environment from the proposals would be undertaken as part of the EIA and the results presented in the ES. The ES would present the full assessment underpinning the conclusions drawn in relation to significant effects.

12.11. Flood risk

a) Baseline environment

12.11.1. A preliminary high level review of the baseline flood risk for the four road improvement locations considered in this chapter is presented in **Table 12.11.1**.

12.11.2. The four schemes for which PEI is provided, their locations, and whether there is a requirement to assess flood risk, are outlined in **Table 12.11.2**.

b) Environmental design and embedded mitigation

12.11.3. The Sequential Test aims to steer development away from areas of high flood risk. The positioning of the majority of the sites in Flood Zone 1 complies with this requirement although part of the Wickham Market highway improvements sits within Flood Zone 2 and 3 and will require further consideration in this context.

12.11.4. The works are unlikely to require specifically embedded flood risk mitigation although standard drainage measures would be used. The same drainage measures would manage on-site flood risk.

c) Preliminary assessment of effects

12.11.5. Appropriate drainage combined with the existing low levels of flood risk, means that increases in off-site flood risk are unlikely and the effects would not be significant. Minor beneficial flood risk effects may occur locally where drainage works result in an improvement to the existing drainage situation.

d) Additional mitigation and monitoring

12.11.6. It is assumed here that the improvements to the road network described above would be adopted by Suffolk County Council, who would continue to monitor and maintain the public highway to preserve integrity and condition.

12.11.7. Periodic inspection and maintenance of the drainage infrastructure may be required to ensure its continued efficacy.

e) Preliminary assessment of residual effects

12.11.8. Increases in off-site flood risk are unlikely and assuming the drainage is monitored and maintained, the residual effects would not be significant. As noted above, minor beneficial flood risk effects may occur locally where drainage works result in an improvement to the existing drainage situation.

f) Completing the assessment

12.11.9. The Wickham Market highway improvements and the A12/A144 junction improvements could require further assessment. A FRA for these sites would be submitted, if required, as part of the application for development consent after the proposals for the Sizewell C development as a whole are finalised. Due to the low impact nature of these sites, the FRA would address flood risk following a proportionate risk-based approach.

Table 12.11.1 Summary of the baseline flood risk for the road improvement sites

Location	Fluvial	Tidal	Surface water	Groundwater	Sewers	Reservoirs and others
Wickham Market highway improvements.	Low to High: Flood Zone 1, 2 and 3.	Low: Beyond tidal extent of River Deben.	Very Low to High.	Likely Low to Medium: No records in the SFRA. Proposed improvements are unlikely to have a significant effect.	Likely Low to Medium: Sewers could be found in roads.	Low: Not at risk of flooding from reservoirs.
Improvements to Mill Street on the B1122.	Low Flood Zone 1.	Low Flood Zone 1.	Very Low.	Likely Low to Medium: No records in the SFRA. Proposed improvements are unlikely to have a significant effect.	Likely Low to Medium: Sewers could be found in roads.	Low Not at risk of flooding from reservoirs.
Improvements to the junction of the A12 and A144.			Very Low to Low.			
Improvements to the junction of the A1094 and B1069.			Very Low to Medium.			

Table 12.11.2 Summary of road improvement schemes and associated flood risk

Location	Flood Risk Assessment (FRA) requirement
Wickham Market highway improvements.	Simple FRA will be required. The site partly is in Flood Zone 2 and 3 and has an increase in impermeable area.
Improvements to Mill Street on the B1122.	No FRA required. No increase in impermeable area and in Flood Zone 1.
Improvements to the junction of the A12 and A144.	Simple FRA may be needed. Increase in impermeable area.
Improvements to the junction of the A1094 and B1069.	No FRA required. In Flood Zone 1.

12.12. Comparison between rail-led and road-led strategies

12.12.1. All but one of the road improvements assessed in this chapter would be built under both the road-led and the rail-led strategies. The environmental effects arising from both the strategies would therefore be broadly similar for those road improvements. The patterns of traffic usage along these upgraded roads or through the junctions are unlikely to be substantially different between the road-led and rail-led strategies.

12.12.2. The Mill Street improvements on the B1122 would only be built under a rail-led strategy, since under a road-led strategy the construction of the Sizewell link road would negate the need for the Mill Street improvement. There are unlikely to be many significant effects arising from the Mill Street works during construction, although approximately six properties would be likely to experience a significant noise effect when construction activity takes place adjacent to their boundaries. Under a road-led strategy, when Sizewell C construction traffic is using the new Sizewell link road, these properties and others along the B1122 would benefit from reduced traffic volumes and lower noise levels compared to the existing situation. By contrast, if Sizewell C construction traffic were to use the B1122 (with the Mill Street improvements) under the rail-led strategy, road traffic and related emissions as well as traffic noise levels along the B1122 would increase compared to the existing situation.

13. Project Wide Cumulative PEI

13.1. Introduction

13.1.1. This chapter presents the overall approach that is being used in the ongoing Environmental Impact Assessment (EIA) to undertake an assessment of cumulative effects and provides a short preliminary review of the main plans, programmes and projects which, together with the Sizewell C proposals, might lead to significant cumulative effects.

13.1.2. Consideration is also given to 'inter-relationship' effects and 'project-wide' effects.

13.2. Background to consideration of cumulative effects

13.2.1. Schedule 4 of the Town and Country Planning Environmental Impact Assessment Regulations 2017 (SI No. 572) (Ref. 13.1) states that the Environmental Statement (ES) should include:

"A description of the likely significant effects of the development on the environment resulting from, inter alia….

The cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources"

and

"The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development."

13.2.2. For the purposes of the Preliminary Environmental Information (PEI) for Sizewell C and the ongoing EIA, the terms 'cumulative' effects and 'inter-relationships' are both used. Definitions, examples and guidance on how they are considered is provided in **Table 13.1**

13.2.3. The coverage of inter-relationships within this PEI and in the ongoing EIA is always presented at the level of the impacted receptor. That is to say, where several impacts act together on a receptor, the assessment is presented in the most logical technical assessment chapter. In **Table 13.1**, using the example of roosting and foraging bat species (i.e. the receptor), which could be disturbed by both operational noise and lighting, the inter-relationship effects are covered as appropriate within the relevant Terrestrial Ecology and Ornithology chapter. Given the preliminary nature of the technical assessments presented in the PEI, the consideration of inter-relationships is at an early stage.

13.2.4. The approach to cumulative effects as defined in **Table 13.1** is set out in further detail in the following section.

13.2.5. In addition, there could also be project-wide effects, which arise from individual Sizewell C related effects, which are not significant in their own right, but could add together across the project to lead to an effect that is significant. The potential for project-wide effects is considered further in **section 13.6** of this chapter.

Table 13.1 Definition of cumulative impacts and inter-relationships

Type of Impact	Definition of Impact	Impact Examples
Inter-relationships: also known as 'intra-project', 'synergistic', 'Type 1 cumulative', or 'interactive' impacts/ relationships	Impacts that occur when different individual environmental impacts of the proposed development combine together to influence particular receptors and have the potential to lead to significant effects. If considered in isolation the individual environmental impacts may not lead to significant effects.	Marine species (i.e. the receptor) affected by the discharge of both a thermal plume and process chemicals during operation.
		Impacts on users of Public Rights of Way (PRoW) (i.e. the receptor) affected by both noise and air quality impacts arising from Sizewell C main development site construction activities, together with footpath diversions and changes in the landscape setting
		Roosting and foraging bat species (i.e. the receptor) at a site disturbed by both operational noise and lighting.
		Local residents (i.e. the receptor) affected by a combination of a degradation of local air quality, increases in noise level, and a higher volume of traffic that will change the character of local roads.
Cumulative: also known as 'inter-project', 'Type 2 cumulative' or 'additive' impacts	These arise when impacts from the proposed development combine with impacts from other planned/potential third party plans or projects (normally in the vicinity of the site), resulting in a change to the overall magnitude of impact acting on a receptor and potentially a change in the resulting effect.	Intrusion by the Sizewell C project on a sensitive viewpoint (i.e. the receptor), combined with another third party project, such as any possible other energy infrastructure in the Sizewell Gap, also visible from the same viewpoint.
		Noise from the operation of the new Sizewell C rail route extension, together with a third party retail development may together affect residential properties or a designated wildlife site (i.e. the receptor).

13.3. The approach to assessment of cumulative effects

13.3.1. Where the impacts from development of Sizewell C could combine with an impact from a third party project, plan and/or programme, it may have the potential to result in a cumulative effect on a given receptor. The broad approach used within the EIA for Sizewell C to consider cumulative impacts is shown in **Figure 13.1**

a) Stage 1: Establishing the Zone of Influence (ZOI) and identifying the 'long list' of other development

i) Defining the Zone of Influence

13.3.2. To inform the assessment of cumulative impacts with other developments, the reasonable maximum geographical area around the main development site and the associated development sites where there is potential for impacts to occur is identified through the derivation of a ZOI.

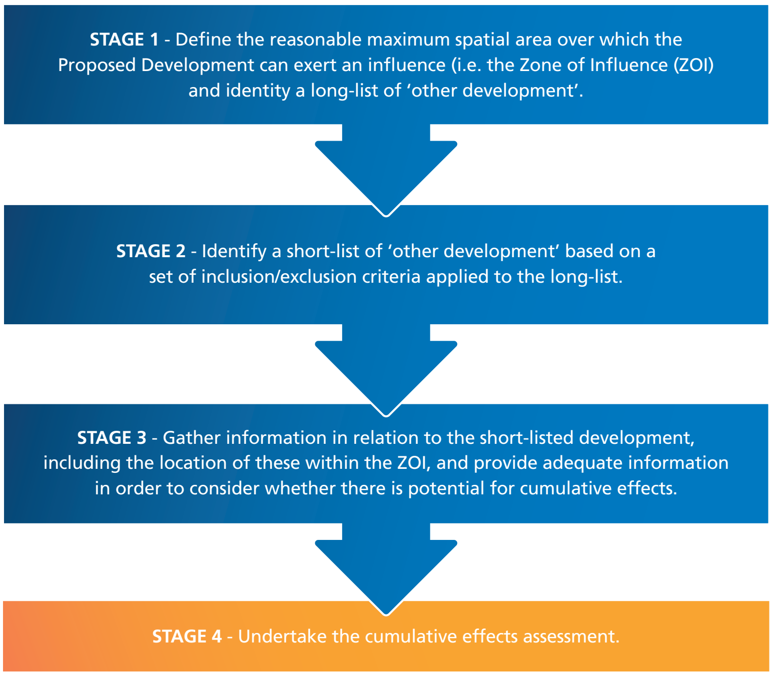
13.3.3. Although the ZOI can potentially differ for different environmental topics, for the purposes of the data gathering exercise, the maximum reasonable ZOI for Sizewell C is considered to be 20 kilometres (km) around the main development site, and 5km around the associated development sites[1] . The ZOI is being mapped using Geographical Information Systems and this forms the search area for non-Sizewell C plans and projects to be included within the 'long list' for initial consideration.

13.3.4. In addition to the schemes within the ZOI, there may be other developments that require consideration on a topic specific basis (for example, major transport schemes affecting the A12 and A14).

ii) Identification of relevant non-Sizewell C development projects, plans and programmes

13.3.5. Other developments are being identified through stakeholder discussion and a review of publically available information (such as on local planning authorities' Planning Portals, Local Planning Framework documents and the Marine Management Organisation's Marine Licence

Figure 13.1 The process of identifying potential cumulative impacts



application portal). An initial identification exercise was undertaken in 2016 but this will be fully updated prior to submission of the application for development consent to inform the preparation of the environmental statement.

13.3.6. Other developments are included on the basis that they are:

- under construction;
- permitted application(s), but not yet implemented (those from five years prior to the assessment are considered, taking into account those which received planning consent three years prior to the assessment and remain valid, but have not been completed);
- submitted application(s) not yet determined (as above);
- refused but subject to appeal procedures not yet determined;
- on the National Infrastructure Planning Programme of projects;
- identified in the relevant development plan (and emerging development plans - with appropriate weight being given as they move closer to adoption) recognising that information on any relevant proposals will be limited; and
- identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

13.3.7. The other developments form the 'long-list' and the status of this list, when updated, will be monitored and updated throughout the pre-application stage up to submission of the application for development consent.

13.3.8. The 'long list' will be filtered using the criteria within Stage 2 of this process (described in the following sections). Once the exclusion criteria set out in **Table 13**. has been applied, a 'short list' of schemes will be produced.

b) Stage 2: Identify 'shortlist' of 'other development'

i) Defining the type of other developments that could result in a potentially significant effect

13.3.9. There are a number of development types, which due to their nature and scale, are not considered to have the potential to cause impacts which could then act with Sizewell C related impacts in a cumulative manner. The most common of these development types to be excluded are identified in **Table 13.2**.

Table 13.2 Projects to be excluded

Projects to be screened-out
Construction of agricultural buildings (e.g. storage of livestock, machinery or feed).
House extensions or cosmetic changes to buildings.
Work to trees.
Micro-generation wind turbines.
Roof mounted solar PV panels (or ground mounted less than 50 kilowatts (kW) output).
Renewal of planning permission for retention of existing operational use.
Variation to planning permissions, including reserved matters applications (where original application would be excluded).

13.3.10. In addition to those development types listed in **Table 13.2**, any other development of a nature or scale without the potential to result in cumulative effects will be excluded. This includes small scale residential uses (less than two dwellings), or changes of buildings' use. This further filter of the short list will be based on professional judgment, and will result in the list being refined down to the schemes with the potential to result in cumulative effects with the Sizewell C proposed development.

13.3.11. Once these criteria have been applied, the remaining developments comprise the 'short list' of other development; this will be known as the 'development schedule'.

[1]It is acknowledged that Sizewell C may have some degree of influence beyond these distances for a small number of topics (for example socio-economics considers impacts upon the whole of East Anglia and ecology considers migratory species). However, these distances include the maximum ZOI for all other topics.

c) Stage 3: Information gathering

i) Providing information to inform assessments

13.3.12. The EIA 'development schedule' will provide the short list of projects within the ZOI (with additions, see above) which have the potential to cause cumulative impacts when considered alongside the Sizewell C related impacts. Technical specialists will identify the schemes that have potential to cause cumulative effects for their technical discipline. Information on these schemes will be provided and will include the following:

- name of development and a brief description of the development proposals (the 'development schedule' short list); and
- maps showing the location of the schemes and ZOI.

13.3.13. Where possible, an allowance for programme changes will be made for some of the larger schemes in the development schedule. This will reflect the potential for construction delays or programme extensions, which will allow technical specialists to more fully understand where overlap could exist between the Sizewell C proposed development and the schemes in the development schedule.

13.3.14. In addition to well-defined projects (developments), plans and programmes will also be included within the development schedule where sufficient information is available to be able to identify them.

d) Stage 4: Assessing the cumulative effects

13.3.15. Technical specialists will identify those projects (developments), plans and programmes on the development schedule, which, because of their scale, nature or programme, require consideration in the context of their own topic area. In many technical areas, it will be possible to screen out many (or even most) of the other developments as there will be no potential for additional or exacerbated significant effects to arise as a result of cumulative impacts.

13.3.16. The greatest difficulty in assessing cumulative impacts relates to programme uncertainty, particularly in relation to third party developments and the extent to which the various construction phases may or may not overlap. Some tolerance will be built into any programmes identified for larger developments within the development schedule to assist with this (as described above in Stage 3).

13.3.17. The process for assessing the cumulative effects in the EIA will follow the same methodology and assessment criteria for each topic chapter. Similarly, the cumulative effects will be reported within the ES following the same significance criteria as for the main assessment. Should a cumulative effect be determined as significant, then mitigation will need to be considered.

13.3.18. There may be limitations to the assessments, such as a lack of detail regarding a project, plan or programme. Likewise, in some cases it may not be possible to undertake a quantitative assessment, meaning that a qualitative assessment and expert judgement will be applied.

13.4. Preliminary assessment of cumulative effects

13.4.1. The full assessment of cumulative effects will be undertaken at the later stages of the EIA, when technical specialists have undertaken their main assessments of the Sizewell C proposals and can then consider the extent to which other plans, programmes or projects might lead to cumulative effects.

13.4.2. However, for the purposes of PEI, it is possible to identify a number of projects and plans which are likely to feature in that assessment and consider the extent to which cumulative effects might arise.

13.4.3. A preliminary short list[2] of the major projects, plans and programmes likely to be included in the development schedule for the EIA is provided below in **Table 13.3.**

13.4.4. A review of the major projects embedded within the 2018 traffic model identified none which were likely to be relevant in technical assessments other than transport and potentially regional socio-economic considerations.

13.4.5. The Scottish Power Renewables and National Grid interconnector proposals listed in **Table 13.3** have the potential to generate cumulative effects in the marine environment, where cable routes could interface with the new offshore Sizewell C structures. Depending on the locations of the onshore facilities, both of these proposed developments also have the greatest potential to generate cumulative effects together with the Sizewell C development.

[2]This is a preliminary list of projects, plans and programmes which have the greatest potential for generating cumulative effects in association with the construction and / or operation of Sizewell C

13.4.6. Although a full development schedule has not yet been completed, based on a number of major projects within the ZOI and more widely within Suffolk, outlined above in **Table 13.3,** it is possible to identify, on a preliminary basis, a number of topic areas where significant cumulative effects are possible. This is considered in **Table 13.4.**

Table 13.3 Projects, plans and programmes identified in 2018

Project, plan or programme	Location	Likely programme
Scottish Power Renewables onshore and offshore facilities for East Anglia One North and East Anglia Two, comprising: Onshore: • two substations (total 20-30ha) • one National Grid compound • temporary construction compound Offshore: • cables to connect to offshore windfarm	Onshore facilities: Friston area or Sizewell Gap (in close proximity to existing Galloper substation) – final decision on location in 2019.	Construction commencing 2024 Operational late 2027
National Grid interconnectors, comprising: Onshore: • converter stations (to 5ha) • cable landfalls of 200m width Offshore: • 'Nautilus' interconnector cables • Eurolink' interconnector cables	Location to be identified by 2020 (Eurolink) and 2022 (Nautilus).	Construction periods of 2023-2024 (Eurolink) and 2025 -2027 (Nautilus). Both interconnectors operational at end of 2027.
Shoreline Management Plan (SMP) 7 (dated 2010) Lowestoft Ness to Felixstowe Landguard Point	Suffolk SMP2 Sub-cell 3c Policy Development Zone 4. Dunwich Cliffs to Thorpeness.	Managed realignment of shoreline over 0-100 years, although large scale realignment not anticipated for 50-100 years.
Royal Society for the Protection of Birds (RSPB) Minsmere coastal change strategy.	Minsmere frontage (four named units within the SMP).	Managed realignment of shoreline over 0-100 years, although large scale realignment not anticipated for 50-100 years.

Table 13.4 Potential for significant cumulative effects

Topic	Potential for significant cumulative effects
Terrestrial Ecology	Other major developments, plans and programmes are unlikely to act in such a manner as could generate additional significant adverse effects, unless an additional quantum of habitat loss or disturbance leads to an effect which crosses a threshold of significance. The Scottish Power Renewables and National Grid interconnector developments in the vicinity are likely to be in areas of arable fields and would not impact the Sizewell Marshes Site of Specific Scientific Interest (SSSI) or other designated terrestrial sites. These developments could however lead to the loss of areas currently allocated for reptile mitigation associated with Sizewell C and unless other measures are put in place, significant cumulative adverse effects on reptiles are possible. The ES will consider further the potential for these developments to lead to cumulative effects on ecology receptors.
Landscape and Visual	Most major developments, plans and programmes are unlikely to act in such a manner as could generate additional significant adverse effects, unless the construction and/or operational programmes overlap substantially and the relevant works are visible from the same location or in the same setting. There is the potential for significant adverse cumulative landscape character and visual effects in relation to the Scottish Power Renewables and National Grid interconnector developments, if these are taken forward in the Sizewell Gap area. The following adverse effects could arise: • Visual effects on users of PRoW in the Sizewell Gap area and including the coastal path within an aggregated ZVI of the schemes. • Visual effects on local residents with visibility of the developments. • Landscape character change within the Area of Outstanding Natural Beauty (AONB), resulting from the cumulative effect of further industrialisation of the Sizewell Gap. The ES will consider further the potential for these and other cumulative visual effects.
Historic Environment	Other major developments, plans and programmes are unlikely to act in such a manner which could generate additional significant adverse cumulative direct effects to archaeological heritage assets, given the discrete nature of archaeological resources. However, developments within the vicinity of any scheme component could result in adverse cumulative change in the settings of heritage assets. These effects would primarily arise as a result of visual change, although other effects such as changes to noise and air quality could contribute to a significant adverse effect. The ES will consider the potential for these effects on heritage assets, such as Leiston Abbey (second site), although given the separation of Leiston Abbey and the Sizewell Gap, significant cumulative effects are unlikely.
Amenity and Recreation	Other major developments, plans and programmes are unlikely to act in such a manner as could generate additional significant adverse effects, unless there was further loss of amenity in the Sizewell gap area, which arises from the cumulative effects of the other energy projects. Assuming any other energy projects proposed in the Sizewell Gap area maintain the relevant PRoWs and other recreational routes, which seems likely, with the possible exception of the coastal path during some periods of construction (cabling works), then no significant cumulative adverse effects on PRoWs and other recreational routes are likely. The ES will give further consideration to the potential changes to amenity particularly in the Sizewell Gap area and for the coastal path.
Soils and Agriculture	Other major developments, plans and programmes are unlikely to act in such a manner as would generate additional significant adverse effects, unless for example an additional loss of farmland makes an existing farm unit unviable. This is considered unlikely in relation to Sizewell C and no significant adverse cumulative effects are likely. The ES will give further consideration to this, once the development schedule is finalised.
Geology and Land Quality	Other major developments, plans and programmes are unlikely to act in such a manner as could generate additional significant adverse effects, given the discrete and local nature of potential contaminative sources. The ES will give further consideration to this, once the development schedule is finalised.
Noise and Vibration	Other major developments, plans and programmes are unlikely to act in such a manner as could generate additional significant adverse effects, unless construction works are planned in parallel with and in close proximity to the Sizewell C construction phase. These could include the Scottish Power Renewables and National Grid interconnector developments if these are taken forward in the Sizewell Gap area and the construction programmes overlap with that for Sizewell C. Any significant cumulative effects are likely to arise at those sensitive receptors closest to the Sizewell Gap. The ES will consider this in detail, once construction methodologies and the construction programme are known for these and other developments.
Air Quality	The potential for additional significant effects during construction is similar to that for noise and vibration presented above

Topic	Potential for significant cumulative effects
Surface Water	Other major developments, plans and programmes are unlikely to act in such a manner as could generate additional significant adverse cumulative effects, unless they impact the water courses of the Leiston Drain, Minsmere Drain catchment or the River Alde. This is considered unlikely for the projects, plans and programmes listed in **Table 13.3.** The ES will consider this further once locations and construction methodologies are known.
Ground Water	Other major developments, plans and programmes are unlikely to act in such a manner as could generate additional significant adverse effects, unless they greatly impact the groundwaters in the vicinity of the main development site. This is considered unlikely for the projects, plans and programmes listed in **Table 13.3.** The ES will consider this further, once locations and construction methodologies are known.
Flood Risk	Other major developments, plans and programmes are unlikely to act in such a manner as could generate additional significant adverse cumulative flood risk effects, unless they impact the catchments of the Leiston Drain, Minsmere Drain catchment or the River Alde. This is possible for the Scottish Power Renewables and National Grid interconnector developments if these are taken forward in the Sizewell Gap area although these would be in Flood Zone 1 and unlikely to impact these catchments if suitable attenuation measures are put in place. The Flood Risk Assessment (FRA) presented in the ES will consider the potential for this.
Traffic and Transport	Other major developments, plans and programmes are already embedded within the transport model used for the traffic assessment. The effects predicted by the transport model are therefore inclusive of the transport impacts of these developments and no further cumulative effects are likely.
Marine Archaeology	The cable routes chosen by the Scottish Power Renewables and the National Grid interconnector developments may generate significant effects in their own right on any resources in the upper sediments but this would not generate cumulative effects with the Sizewell C proposals, since almost all of the impacts of the Sizewell C outfall and intake works would be in the underlying rock strata, rather than soft sediments. The ES will consider this in detail, once construction methodologies are known.
Marine Ecology	Depending on the cable routes chosen by the Scottish Power Renewables and the National Grid interconnector developments there is a potential for cumulative effects on marine ecology including loss or damage to marine habitats and construction related disturbance. The ES will consider this in detail, once cable routes are known.
Marine Water Quality	Depending on the construction methodology for the cabling used by the Scottish Power Renewables and the National Grid interconnector developments, there is a potential for cumulative effects on marine water quality, including sediment mobilisation. The ES will consider this in detail, once the likely approaches to construction techniques in intertidal and subtidal areas are known.
Marine Geomorphology	Depending on the cable routes chosen by the Scottish Power Renewables and the National Grid interconnector developments, particularly in the intertidal zone, there is a potential for cumulative effects on geomorphology including sediment migration. The ES will consider this in detail, once cable routes and the approaches to working in intertidal and subtidal areas are known. Both the SMP 7 and the RSPB Minsmere coastal change strategy set strategic contexts for consideration of marine geomorphology and will be considered in detail in the ES to determine whether they have the potential for cumulative effects alongside the Sizewell C proposals for new coastal sea defences.
Radiological Effects	Other major developments, plans and programmes are unlikely to act in such a manner as could generate additional significant adverse effects

13.5. Cumulative effects – next steps

13.5.1. The assessment of cumulative effects will be undertaken in accordance with the methodology defined above, including as a first step, the updating of the 'long list' of developments. The ES will include an assessment of cumulative effects in each technical area.

13.6. Project-wide effects

13.6.1. Additional significant project-wide effects, as defined above in **section 13.2**, are those which arise from individual elements of the Sizewell C proposals, which although they do not lead to significant effects in their own right, could add together across the project to lead to an effect that is significant. As many of the associated developments are relatively remote geographically from both each other and the main development site, the potential for additional significant project-wide effects is rather limited. The potential for additional significant project effects tends to arise in the following circumstances:

- where sensitive receptors are in the proximity of both the main development site and the green rail route (and any track replacement works required on the Saxmundham to Leiston branch line); and
- where individual impacts arising at discrete locations could impact a widely distributed receptor (e.g. a local bat population or 'best and most versatile' agricultural land) above some critical threshold, such as to cause a significant adverse effect, but which would not be reached from the individual impacts considered in isolation.

Table 13.5 Potential for significant project-wide effects

Topic	Potential for significant cumulative effects
Terrestrial Ecology	Individual elements of the Sizewell C proposals are unlikely to act in such a manner as could generate additional significant adverse project-wide effects, unless an additional quantum of habitat loss or disturbance leads to an effect which crosses a threshold of significance. The following impacts have the potential to generate additional project-wide adverse effects: • Disturbance during construction to bats and potentially other species as a result of the green rail route and the main development site. • Impacts to and fragmentation of species populations (principally bats and great crested newts) arising from the associated developments (particularly the new roads) and the main development site. The ES will consider further the potential for the individual elements of the proposals to lead to project-wide effects on ecology receptors.
Landscape and Visual	Individual elements of the Sizewell C proposals are unlikely to act in such a manner as could generate additional significant project-wide adverse effects, unless the relevant works are visible from the same location or in the same setting. There is the potential for significant adverse cumulative landscape character and visual effects particularly in relation to the green rail route and the main development site. The following adverse effects could arise: • Visual effects on users of PRoW within an aggregated ZVI of the schemes. • Visual effects on local residents with visibility of the developments. • Landscape character change within the AONB. The ES will consider further the potential for these and other project-wide visual effects.
Historic Environment	Individual elements of the Sizewell C proposals are unlikely to act in such a manner which could generate additional significant adverse direct project-wide effects on archaeological heritage assets, given the discrete nature of archaeological resources. However, developments within the vicinity of any scheme component could result in adverse project-wide change in the settings of heritage assets. This is likely to be the case at Leiston Abbey (second site), the setting of which will be affected by both the nearby main development site and the proposed green rail route, if built under the rail-led scenario. The ES will consider further the potential for these project-wide effects on above ground heritage assets.
Amenity and Recreation	Given their discrete geographic locations, most individual elements of the Sizewell C proposals are unlikely to act in such a manner which could generate additional significant adverse project-wide effects on amenity or recreation. The main exceptions to this include: • Amenity receptors including PRoW which are adversely affected by both the main development site and the green rail route built under the rail -led scenario (see also Leiston Abbey above). • Receptors such as the Minsmere RSPB reserve which could be adversely affected by disturbance impacts, from the main development site, but could also be affected by the wider impacts in the local area, such as any detrimental impacts to tourism. The ES will give further consideration to amenity arising from the individual elements of the Sizewell C proposals as well as the wider socio-economic effects.
Soils and Agriculture	Individual elements of the Sizewell C proposals are unlikely to act in such a manner which could generate additional significant adverse project-wide effects on soils and agriculture, unless the individual losses of farmland or fragmentation arising from the different project elements make an existing farm unit unviable or if the total loss of valued soils exceeds a particular threshold of significance. Given the relatively dispersed locations of the associated developments, no additional project-wide effects are anticipated in relation to the viability of existing farm units. An assessment has not yet been made on the total loss of agricultural land but the ES will give further consideration to this.

Topic	Potential for significant cumulative effects
Geology and Land Quality	Given the relatively dispersed locations of the associated developments, no additional project-wide effects are anticipated in relation to land quality, given the discrete and local nature of potential contaminative sources. The ES will give further consideration to this.
Noise and Vibration	Given their discrete geographic locations, most individual elements of the Sizewell C proposals are unlikely to act in such a manner which could generate additional significant adverse project-wide noise and vibration effects, unless construction works for individual associated developments are planned in parallel with and in close proximity to each other or the main development site. This is likely to be the case for some of the other rail improvements (e.g. any track replacement on the Saxmundham to Leiston branch line), the green rail route (built under a rail-led strategy) and the main development site. The ES will consider the potential for additional effects in detail, once construction methodologies and the construction programme are defined further, particularly under the rail-led strategy, given the proximity of some elements of the Sizewell C proposals, identified above.
Air Quality	The potential for additional significant project-wide air quality effects during construction arises for similar reasons to that for noise and vibration presented above. Additional significant project-wide effects are thought unlikely to arise in respect of dust as the effects tend to be more localised than for noise. The ES will consider the potential for additional project-wide air quality effects in detail, once construction methodologies and the construction programme are defined further, particularly given the widely distributed patterns of construction traffic and the related emissions.
Surface Water	Given their discrete geographic locations, individual elements of the Sizewell C proposals are unlikely to act in such a manner which could generate additional significant adverse project-wide effects on surface water unless they individually impact the same water courses, such as the Leiston Drain, the Minsmere Drain catchment or the River Alde and the resultant effect is significant. Any relevant project-wide effects will be reported in the ES.
Ground Water	Given their discrete geographic locations, individual elements of the Sizewell C proposals are unlikely to act in such a manner which could generate additional significant adverse project-wide effects on groundwater unless they further impact the groundwater movements at the main development site. The impacts of the green rail route on groundwater are minimal and no additional adverse project-wide effects are anticipated although further modelling and assessment will be undertaken for the main development site which will incorporate any relevant impacts from the green rail route. This modelling, the likely effects and any relevant project-wide effects will be reported in the ES.
Flood Risk	Given their discrete geographic locations, individual elements of the Sizewell C proposals are unlikely to act in such a manner which could generate additional significant adverse project-wide effects on flood risk unless they individually impact the same catchments, such as the Leiston Drain, the Minsmere Drain catchment or the River Alde. Most the of the associated developments are in Flood Zone 1 and so are unlikely to impact these catchments individually if suitable attenuation measures are put in place and therefore additional project-wide effects are unlikely. The FRA presented in the ES will consider the potential for this in greater detail.
Traffic and Transport	Each associated development of the Sizewell C proposals is embedded within the transport model used for the traffic assessment. The effects predicted by the transport model are therefore inclusive of the transport impacts of these developments and are essentially project-wide effects in their own right. The effects are summarised in the individual PEI chapters. Where these effects arise at locations which are not covered by existing PEI chapters, these are summarised below. No additional project-wide transportation effects are likely.
Marine Archaeology Marine Ecology Marine Water Quality Marine Geomorphology	The effects on marine resources would arise only in the vicinity of the main development site and are reported in the main development site PEI chapter **(Volume 2A, Chapter 2)**. There is no potential for additional project-wide effects, as all of the offsite associated developments are entirely terrestrial.
Radiological Effects	The potential for radiological effects arises only in the vicinity of the main development site and this is reported at **Chapter 14** of this volume.

13.6.2. Although the consideration of project-wide effects is important, given that additional significant effects may be identified as a result as described above, it is also important to note that effects that may already have been identified as significant in their own right, might be further exacerbated by the additional changes arising from other elements of the proposals. This will be considered further in the ES, but the commentary provided in **Table 13.5** is also valid for consideration of site-based effects that might be exacerbated at the project-wide level.

13.6.3. The potential for significant project-wide effects which are additional to those identified in relation to individual elements of the proposals is considered on a preliminary basis in **Table 13.5.**

13.6.4. **Table 13.6** below provides a list of locations with notable traffic increases associated with the construction of Sizewell C but in locations where there is no associated development within the immediate vicinity. The remaining traffic increases are explained in the relevant PEI for nearby associated development. All of the locations, other than A144 at Halesworth (location K), are mentioned in **Volume 1, Chapter 6** which also identifies the locations on a plan.

13.6.5. The predicted increases in traffic shown in **Table 13.6** sit within the carrying capacities of the roads but the extent to which they are likely to lead to significant adverse noise or air quality effects will be considered further in the ongoing EIA. In both cases, relatively large percentage traffic increases are not in themselves significant, but depend on the existing context and will be assessed accordingly.

Table 13.6 Project-wide traffic effects arising at individual locations (and remote from other associated developments)

Location	Rail-led	Road-led
	Estimated percentage traffic increase from Sizewell C rail-led	Estimated percentage traffic increase from Sizewell C road-led
B1122 Abbey Road, central Leiston (location B)	69% - 70%	64% - 65%
B1119 Saxmundham Road, Leiston (location C)	31% - 32%	20% - 27%
B1125 Blythburgh (location L)	24%	22% - 24%
B1125 Westleton (location F)	22%	19% - 22%
A1120 Yoxford (location J)	18%	18%
B1122 Aldeburgh (location E)	15% - 16%	14% - 16%
A12 Blythburgh (location W)	16% - 16%	16% - 17%
B1069 Coldfair Green (location D)	16%	15% - 16%
B1069 Tunstall (location H)	11% - 15%	11% - 14%
A12 Wrentham (location V)	11% - 12%	11% - 12%
Lover's Lane, Leiston (location A)	12%	16% - 22%
A12 Yoxford (location Y)	9% - 11%	2% - 7%
A12 south of Wickham Market park & ride (location Z)	9% - 11%	9% - 11%
A12 Marlesford (south of two village bypass) (location AB)	8% - 9%	9% - 10%
B1121 Saxmundham (location I)	6% - 8%	-9%
A144 Halesworth (location K)	7% - 7%	7% - 7%
A12 Woodbridge (location AA)	1% - 6%	1% - 7%

14. Related Assessments and Approaches

14.1. Introduction

14.1.1. In parallel with the work being undertaken to develop the design of the proposals, EDF Energy has been making progress on the assessments that are subject to their own regulations and requirements.

14.1.2. The first part of this section provides an overview of the outputs of the related assessments, specifically in terms of describing the approach, progress to date and next steps as follows:

- **section 14.2** Environmental Impact Assessment (EIA);
- **section 14.3** Habitats Regulations Assessment (HRA); and
- **section 14.4** Water Framework Directive (WFD) compliance strategy.

14.1.3. The second part of this section describes the approach being taken on project-wide matters as follows:

- **section 14.5** Conventional waste strategy and related assessment; and
- **section 14.6** Radiological impact assessment.

14.2. Environmental Impact Assessment

a) Introduction

14.2.1. The EIA is an iterative process that examines the potential impacts on the environment resulting from a proposed development. It is an inherent part of the evolution of a project, identifying constraints and opportunities and informing the design so that likely significant environmental effects are mitigated.

14.2.2. The EIA for Sizewell C is ongoing and is considering the likely significant effects of the project on the environment resulting from the construction and operational phases and the removal and restoration of the temporary associated developments, such as the park and ride sites.

14.2.3. Since the Stage 2 consultation, EDF Energy has developed its proposals and continued to collect Preliminary Environmental Information (PEI). Through further studies and ongoing design development, we have identified a number of significant environmental effects that may arise in connection with the project.

14.2.4. The preliminary conclusions of the ongoing EIA are reported with the PEI within this volume. The PEI also provides a summary of progress on the Flood Risk Assessment (FRA) – the final FRA will also be submitted along with the application for development consent.

14.2.5. Where possible, throughout the PEI chapters, we have identified appropriate mitigation measures and explained how these measures would address those significant adverse environmental effects that might otherwise arise. As these assessments are developed, we will continue to consider how any outstanding significant adverse effects might be addressed.

b) Next steps

14.2.6. Feedback from this Stage 3 consultation will further inform the scope and detail of the Environmental Statement (ES) which will be submitted in support of an application for development consent. The ES will be compliant with the EIA Regulations and, subject to particular issues being scoped out, will include:

- a description of the proposals;
- a description of the reasonable alternatives considered by EDF Energy and the main reasons for the choices made, taking into account potential environmental effects;
- a description of the baseline state of the environment without implementation of the proposals;
- a description of the aspects of the environment likely to be affected by the proposals;
- a description of the likely significant effects of the proposals on the environment;
- a description of the forecasting methods or evidence used to identify and assess the significant effects on the environment and an indication of any difficulties (e.g. technical deficiencies) encountered in compiling the required information;
- a description of the measures envisaged to avoid, prevent, reduce and, where possible, off-set any significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements;
- a description of any expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the proposals;

- a non-technical summary; and
- a reference list detailing the sources used for the descriptions and assessments included in the ES.

14.3. Habitats Regulations Assessment introduction

14.3.1. The Habitats Directive was transposed into national law (Ref. 14.1) and provides stringent legal protection to sites designated as being of European (or international) importance for nature conservation. It takes effect in addition to other forms of protection that may apply, such as in relation to Sites of Special Scientific Interest (SSSI), or through protected species legislation.

14.3.2. The nearest European sites to the main development site (see **Terrestrial ecology and ornithology, section 3** and **Figure 2.3.1**) are:

- the Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site, located adjacent and to the north of the main development site;
- the Outer Thames Estuary SPA, the immediate offshore marine environment inside and outside of the Sizewell bank;
- the Southern North Sea SAC for the protection of harbour porpoise[1], again covering the immediate offshore marine environment inside and outside of the Sizewell bank; and
- the Sandlings SPA, located to the south of the main development site.

14.3.3. Potential effects on other European sites located further afield, together with the European sites nearest to the associated development sites, are also being investigated.

14.3.4. The assessment (referred to as a HRA) is a two stage process. The first stage considers whether the proposals (either acting alone or in combination with other plans and projects) have the potential to cause a significant effect. This is called Likely Significant Effect (LSE) screening, which is a high level review of all potential cause-effect impact pathways on European sites.

14.3.5. Potential cause-effect impact pathways are considered in relation to the specific interest features of the designated site that make it special (i.e. particular types of habitat or species). The assessment also considers potential impacts on habitats outside of the designated site where these habitats support the special interest features of the designated site, for example birds which may forage over a larger area.

14.3.6. A further stage of the process considers areas of potential LSE that are subject to detailed investigation in order to establish if effects are likely to occur and, if they are, how significant the effects would be. This stage is termed 'Appropriate Assessment' (AA), which considers the likely effects of the proposals (alone and in-combination with other plans and projects) on the interest features of the site. 'Significance' in this context is a measure of whether the proposals have the potential to compromise the site's conservation objectives (i.e. whether the effect has the potential to undermine the designated criteria of the European site). Where significant effects are predicted, mitigation needs to be considered.

14.3.7. An important principle of the HRA is that it is carried out on a 'precautionary' basis. This means that it must be established beyond reasonable scientific doubt that significant adverse effects on European sites would not occur as a result of the proposals. It follows that robust evidence (i.e. project information, baseline data, published evidence on likely receptor responses to impacts) is required to inform the assessment.

a) Evidence Plan

14.3.8. Preparation of an Evidence Plan is a voluntary and developer-led process. It aims to facilitate early, effective and sustained pre-application consultation between developers and relevant nature conservation stakeholders to agree the evidence that needs to be provided to inform the HRA.

14.3.9. Since March 2014, EDF Energy has been working with a wide range of statutory and non-statutory stakeholders to develop an Evidence Plan for the HRA. These stakeholders include: Natural England (in its capacity as the Lead Statutory Nature Conservation Body); the Environment Agency; the Marine Management Organisation (MMO); Suffolk Coastal District Council (SCDC); Suffolk County Council (SCC); the Planning Inspectorate (PINS) (in its capacity as advisor to the Secretary of State); the Major Infrastructure Environment Unit; Suffolk Wildlife Trust (SWT); and the Royal Society for the Protection of Birds (RSPB).

14.3.10. The Evidence Plan was published on the PINS website in 2014 (Ref. 14.2). It sets out an agreed position with the stakeholders on areas of potential impact in relation to European sites, as well as specifying the environmental information that needs to be provided to

[1]The five associated harbour porpoise SACs consulted on in 2016 were given Ministerial clearance and were submitted to the European Commission for approval to designate on 30 January 2017. For the purposes of the assessment we presume the designation.

inform the impact assessment. This is being kept under review to inform the ongoing HRA.

b) Likely Significant Effects report

14.3.11. In 2018, EDF Energy undertook an updated LSE screening using a series of matrices for each potentially impacted site and used a 'Red Amber Green' coding approach to identify those impacts and sites which required further assessment. A series of workshops with stakeholders is planned to examine aspects of the HRA, defined by the LSE screening including:

- the effects of the proposed development on breeding marsh harrier (Circus aeruginosus) at Minsmere, taking into account the marsh harrier habitat mitigation works that are being implemented, as well as the potential for noise impacts of construction;
- the effects of the proposed development on breeding waterfowl at Minsmere, taking into account the potential for noise impacts of construction; and
- the effects of the proposed development on foraging red-throated divers and little terns in the offshore areas, in the vicinity of the outfall and intake structures.

c) Next steps

14.3.12. EDF Energy will continue to update the LSE report as further information becomes available. EDF Energy will hold discussions with stakeholders on key aspects to prepare the required information to inform the HRA prior to submitting an application for development consent. After the application has been submitted, the Secretary of State will undertake the HRA as part of the decision-making process.

14.4. Water Framework Directive

a) Introduction

14.4.1. Directive 2000/60/EC of the European Parliament and of the Council referred to as the WFD (2000) (Ref. 14.3), was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref. 14.4). Two 'daughter' directives, aimed at protecting groundwater, and another aimed at reducing the pollution of surface water (rivers, lakes, estuaries and coastal waters) by pollutants on a list of priority substances, have also been adopted at European level.

14.4.2. The requirements of the WFD need to be taken into account in the planning of all new activities that may impact on any aspect of the water environment. To meet the requirements of the WFD, the competent authority (the Environment Agency) has set environmental objectives for each water body. A default objective for all water bodies is to prevent deterioration and to ensure no change in either the 'Ecological Status' (for natural water bodies) or the 'Ecological Potential' (for heavily modified or artificial water bodies). A WFD compliance assessment for the proposed development will be prepared, in consultation with the Environment Agency, to meet the requirements of the WFD.

b) Process

14.4.3. A strategy has been developed which sets out the approach to undertaking a project-level WFD compliance assessment, which involves the following four stages. These stages relate to WFD stages of assessment and not the Sizewell C consultation stages of the same name.

i) Stage 1: Collation of baseline information to inform the assessment

14.4.4. The collation of available baseline data, including information on the project, the baseline environment, and the water bodies which potentially could be impacted.

ii) Stage 2: Scoping

14.4.5. The identification of whether there is potential for deterioration in water body status or failure to comply with WFD objectives in any of the water bodies identified in Stage 1. If impacts are predicted, a detailed compliance assessment is required, as described in the following section.

iii) Stage 3: Detailed compliance assessment

14.4.6. Assessment of whether the activities and/or components of the project could cause deterioration, and whether this deterioration would have a significant non-temporary effect on the status of one or more WFD quality elements at water body level. The test determines whether the activity is likely to affect a quality element to an extent that would lower its existing status, or prevent the status objectives being achieved in another water body. If it is established that an activity and/or component of the project is likely to affect water status at water body level, or that an opportunity may exist to contribute to improving status at a water body level, potential measures to avoid the effect, or achieve improvement, would be investigated.

iv) Stage 4: Summary of mitigation, improvements and monitoring

14.4.7. A summary strategy would set out the preceding stages, including an overview of the results of the assessment and whether proposed activities have been screened out, assessed in detail, or mitigated against. Details of any identified improvements as part of the development and any monitoring required would also be described.

c) Key considerations

14.4.8. The work completed to date has identified that the following water bodies have the potential to be impacted by either construction and/or operational activities:

- Leiston Beck (GB105035046271) (river): Activities associated with initial site preparation, earthworks for platform development, the groundwater cut-off wall and the permanent Site of Special Scientific Interest (SSSI) crossing have the potential to impact upon the status of this water body. In particular, these activities could affect the hydromorphological, physico-chemical and biological quality elements.
- Suffolk (GB650503520002) (coastal): Activities associated with the marine outfall and intake structures and beach landing facility (BLF), discharge of commissioning water, discharge of foul water, intake of cooling water, and the discharge of trade effluent have the potential to impact upon the status of this water body. In particular, these activities could affect the physico-chemical and biological quality elements.
- Walberswick Marshes (GB610050076000) (coastal lagoon): Activities associated with the marine structures and BLF, discharge of commissioning water, discharge of foul water, and the discharge of trade effluent have the potential to impact upon the status of this water body. In particular, these activities could affect the physico-chemical and biological quality elements.
- Alde and Ore (GB520503503800) (transitional): Activities associated with the marine structures and BLF, discharge of commissioning water, discharge of foul water, and the intake of cooling water have the potential to impact upon the status of this water body. In particular, these activities could affect the biological quality elements.
- Blyth (S) (GB510503503700) (transitional): Activities associated with the marine structures and BLF, discharge of commissioning water, discharge of foul water, and the intake of cooling water have the potential to impact upon the status of this water body. In particular, these activities could affect the biological quality elements.
- Waveney and East Suffolk Chalk and Crag (GB40501G400600) (groundwater): Activities associated with initial site preparation, earthworks for platform development, the groundwater cut-off wall, the permanent SSSI crossing, and surface water drainage have the potential to impact upon the status of this water body. These activities could affect both the quantity and quality of groundwater.
- Other water bodies will be relevant to the other associated development sites and activities associated with them have the potential to affect the hydromorphological, physico-chemical and biological quality elements of the water bodies.

d) Next steps

14.4.9. Stage 3 of the assessment will be undertaken in accordance with the methodology presented to the Environment Agency. Thereafter, mitigation and monitoring measures will be identified and discussed with the Environment Agency. It is intended that, once available, EDF Energy will present its findings (including any mitigation proposals) in support of a further stage of consultation, prior to submitting an application for development consent.

14.5. Conventional waste strategy

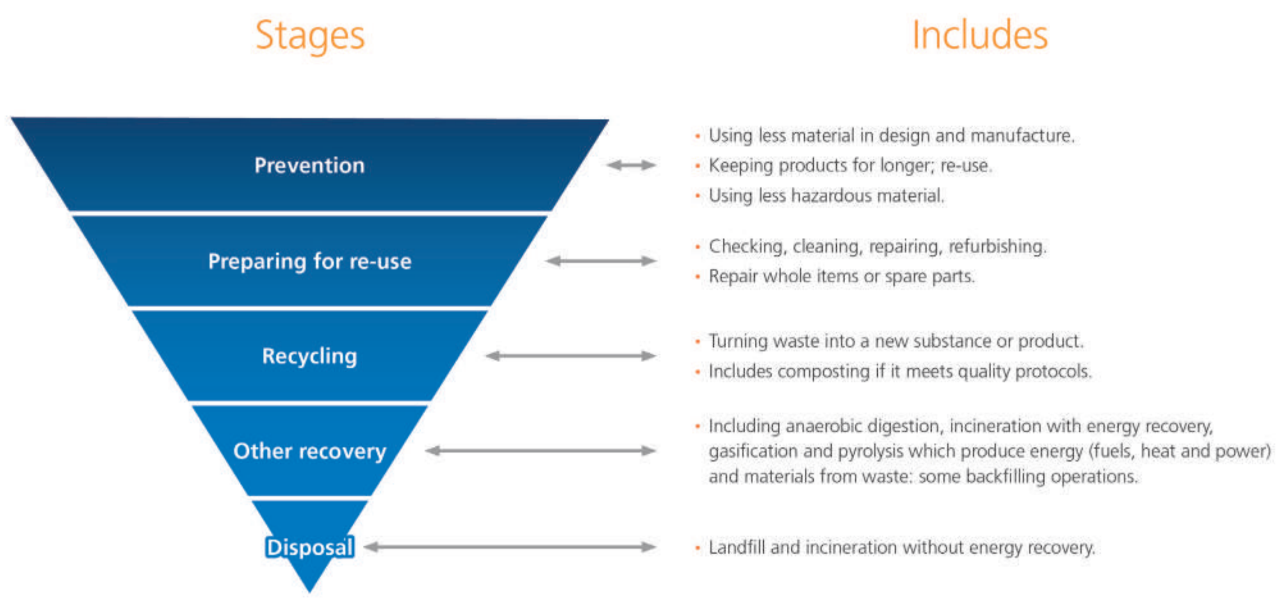
a) Introduction

14.5.1. The conventional waste strategy for the project will consider the management of non-radioactive waste streams.

14.5.2. We aim to achieve best practice in waste management and performance. Accordingly, the following objectives have been developed for the management of conventional waste (refer to **Figure 14.5.1**) during both the construction and operational phases of Sizewell C nuclear power station:

- to prevent and reduce the volume of waste produced through the application of the waste hierarchy in both design and construction;
- to maximise re-use and recycling within the project; and
- to minimise the impact upon the existing waste management infrastructure.

Figure 14.5.1 Waste hierarchy



14.5.3. In conjunction with the waste hierarchy, the proximity principle is being considered in the development of the waste strategy. The proximity principle encourages the management of waste close to its place of generation, thus reducing the impacts of transporting waste over long distances and promoting management of waste within its region of origin.

14.5.4. An assessment is currently being undertaken to determine the potential impact of conventional waste associated with the construction and operation of Sizewell C nuclear power station. A summary of the assessment is provided below and considers:

- the main waste streams and predicted volumes likely to arise from the construction and operation of Sizewell C nuclear power station, and construction, operation and decommissioning of the associated developments, where relevant, including the accommodation campus;
- potential impacts upon existing waste infrastructure; and
- measures that may be implemented to prevent and minimise waste generation.

14.5.5. A detailed review of relevant key international, national, regional and local waste policies, strategies, legislation and industry guidance has been undertaken and these have been considered when developing the assessment and strategy for managing conventional waste.

14.5.6. An analysis of the baseline conditions at local, regional and national levels has been conducted to provide a comparison for assessing any potential impacts. This includes consideration of the following:

- local authority collected waste (i.e. municipal waste), commercial and industrial (C&I) waste and construction and demolition waste;
- current levels of waste generation at the local, regional and national levels;
- current trends in waste management practice at the local, regional and national levels; and
- a review of available waste management facilities likely to be affected by the project.

14.5.7. An assessment of the required waste storage provision for construction, operational and removal and restoration wastes (excluding the decommissioning of Sizewell C power station) is being undertaken, based on estimated waste generation figures.

b) Estimated conventional waste arisings

14.5.8. In order to estimate the anticipated waste volumes for the construction of Sizewell C, reference has been made, where required, to the ongoing construction of the Hinkley Point C nuclear power station in Somerset, England. This is considered to be an appropriate reference for most activities as it is using similar construction techniques and is likely to produce comparable waste types and quantities. A waste model has been developed for the Sizewell C conventional waste strategy. This will enable presentation of this information and any assumptions made in identifying waste quantities likely to be generated at each phase of the project.

i) Construction earthworks

14.5.9. As at Hinkley Point C, excavated materials, created during the construction of Sizewell C, would largely be retained on the main development site for re-use as backfill and landscaping. This would significantly minimise the amount of material classified as waste during the enabling works and earthworks phases of construction.

14.5.10. It is possible that a small fraction of the excavated materials at Sizewell C would be contaminated, particularly in the area of Coronation Wood, due to previous land use. If this is the case, a percentage of this material may become waste and would require appropriate management. Most of the Sizewell C main development site and its associated development sites have limited, if any, history of previous development and no significant contamination is expected.

14.5.11. For the new roads, road improvements and rail infrastructure included within the proposals, it is likely that any excavated material would be used in the cut and fill balance required along the road and rail alignments and will need to be managed as waste. The construction of the new roads may encounter localised hot spots of contamination (such as small isolated and unregulated landfills) and so small volumes of hazardous waste are also likely to be encountered.

ii) Construction Sizewell B relocated facilities

14.5.12. The removal of approximately ten buildings on the Sizewell B site will be required to enable the start of construction on the main development site for Sizewell C. Waste from this demolition process will predominantly consist of concrete and metal, with a small quantity of other material types from the internal fittings.

14.5.13. Demolition activities are estimated to generate approximately 10,000 tonnes of construction and demolition waste. It is expected that much of this waste will be retained for use on-site as part of the construction works. The remaining waste will require treatment or disposal off-site.

iii) Construction excluding earthworks

14.5.14. Construction waste would be generated through off-cuts from fitting materials, breakages and spent materials and would include, but not be limited to, municipal wastes, concrete, metal, wood and plastic. Reference to the predicted construction waste arisings for Hinkley Point C suggests that a construction waste total of approximately 380,000 tonnes, requiring off-site management, would be expected at Sizewell C over the course of the construction period. This total would include arisings from the main development site as well as the on-site and off-site associated development.

14.5.15. Construction waste arisings from the main development site is estimated as 240,000 tonnes. For the associated developments, including campus, rail and highways, the construction waste arisings are estimated to be 140,000 tonnes.

14.5.16. The average annual construction waste arisings from Sizewell C is estimated to be 42,500 tonnes. The annual construction waste arisings for Sizewell C will peak in the second half of the construction phase and are then estimated to be 62,500 tonnes.

14.5.17. The total of hazardous waste arisings from the construction phase is estimated to be 9,200 tonnes. This will typically include chemicals and oils used as part of the construction works. The average annual hazardous construction waste arisings are estimated to be 1,000 tonnes. The average annual hazardous construction waste arisings for Sizewell C will peak in the second half of the construction phase and are then estimated to be 2,300 tonnes.

iv) Suffolk context

14.5.18. The Suffolk Minerals and Waste Local Plan– Suffolk Waste Study provides future baseline estimates for construction waste arisings across Suffolk of 497,000 tonnes in 2018[2] decreasing to 402,000 tonnes in 2029[3]. The same study also provides baseline estimates for hazardous waste arisings across Suffolk of 42,292 tonnes in 2018 decreasing to 32,429 tonnes in 2029[4].

14.5.19. These future predictions mean that Sizewell C construction waste arisings are forecast to represent approximately 15.5% of total Suffolk construction waste arisings in the later years of construction. Similarly, Sizewell C hazardous waste arisings would represent approximately 5% of total Suffolk arisings the first year, which includes the demolition and site clearance.

v) Storage provision

14.5.20. Waste produced on the main development site and the campus during construction may be best managed with the provision of two waste consolidation centres for the storage, segregation and treatment of construction waste.

14.5.21. Storage would allow for the segregation of waste such as metals, wood, soils, inert and residual waste. Processes undertaken at waste facilities in the region would be considered when identifying the level of segregation required at the site. The aim would be to ensure that waste was provided in the most suitable form possible to maximise the potential for recycling and to minimise double handling.

vi) Operational waste – construction phase

14.5.22. This section covers operation of the associated development facilities, including the accommodation campus, during the construction phase of the main development site.

14.5.23. The operational waste volumes for Sizewell C have been estimated using the Department for Environment, Food and Rural Affairs' local authority collected waste generation statistics from April 2016 to March 2017 for SCC and SCDC (Ref. 14.6) as well as West Suffolk Waste Planning Guidance (Ref. 14.7), the British Standard 5906 (Ref. 14.8), and other relevant industry guidance.

vii) Associated developments

14.5.24. The municipal solid waste associated with the fully occupied accommodation campus is estimated to total 6,900 tonnes over a 6-year period with an annual average of 1,150 tonnes. This is likely to include general black bag waste, food waste and dry recyclables such as cardboard, paper and plastics.

14.5.25. The C&I waste associated with the associated developments is estimated to total 13,800 tonnes over the same period with an annual average of 2,300 tonnes. This waste is likely to include general black bag waste and dry recyclables such as cardboard, paper, green waste and plastics.

viii) Suffolk context

14.5.26. The Suffolk Minerals and Waste Local Plan– Suffolk Waste Study provides future baseline estimates for municipal waste across Suffolk of 408,000 tonnes in 2018 increasing to 444,000 tonnes in 2029. Municipal waste from the campus would represent approximately 0.25% of total Suffolk arisings in the later years of construction.

14.5.27. The same study also provides future baseline estimates for C&I waste arisings across Suffolk of 825,000 tonnes in 2018, increasing to 1,008,000 tonnes in 2029[5] C&I arisings from the associated development sites would represent approximately 0.23% of total Suffolk arisings in the later years of construction.

ix) Storage provision

14.5.28. When the campus is operational, storage will be provided to allow for the segregation of dry recyclable waste, organic waste and residual waste, in order to ensure the municipal waste streams can be easily integrated into the region's waste management systems.

14.5.29. When the other associated developments such as the offices, canteen and park and ride facilities are operational, storage would be provided locally to allow for the segregation of dry recyclable waste, organic waste and residual waste, in order to ensure the waste streams can be easily integrated into the region's waste management systems.

[2]These dates have been used as a baseline for the period of construction of Sizewell C. These figures are baseline data taken from the Suffolk Minerals and Waste Plan. They are being used as a comparison for the quantity of waste the project is estimated to generate, against that which is typically managed in Suffolk in any one year.

[3]Suffolk Minerals and Waste Local Plan- Suffolk Waste Study (September 2017) (Ref. 14.5)- Construction and Demolition Waste Forecast to be managed in permitted facilities to 2036.

[4]Suffolk Minerals and Waste Local Plan- Suffolk Waste Study (September 2017)–Construction and Demolition Waste Forecast to be managed in permitted facilities to 2036.

[5]Suffolk Minerals and Waste Local Plan- Suffolk Waste Study (September 2017)–Construction and Demolition Waste Forecast to be managed in permitted facilities to 2036.

x) Removal and restoration – on-site and off-site associated developments

14.5.30. A number of the associated developments would be removed at the end of their use, including the accommodation campus, both park and ride facilities and the green rail route and waste would be generated in the removal process.

14.5.31. The total waste associated with the removal of these developments is estimated to be 443,000 tonnes over a period of up to two years.

14.5.32. The majority of the waste produced during removal of the associated development will be considered as construction and demolition waste. As identified above, the Suffolk Waste Study provides future baseline estimates for construction waste arisings across Suffolk of 497,000 tonnes in 2018[6] decreasing to 402,000 tonnes in 2029[7]. The construction and demolition waste arisings from the associated development sites would represent approximately 55% of total Suffolk arisings in the later years of construction.

xi) Operational waste – Sizewell C power station

14.5.33. The Sizewell C power station would be operational for approximately 60 years. Conventional waste produced would originate from welfare facilities, offices and activities including the maintenance of plant and equipment. The operational waste arisings for the power station are predicted based upon forecasts undertaken for a single Evolutionary Pressurised Reactor (UK EPR) in EDF Energy and Areva's 'Generic Design Assessment (GDA) UK EPR – Integrated Waste Strategy Document', 2012 (Ref. 14.9). Hinkley Point C power station based its operational waste arisings on a previous version of this document.

14.5.34. In total, the C&I waste associated with the power station during operation is estimated to be 68,400 tonnes (over 60 years) with the average annual waste arisings estimated as 1,140 tonnes. Of the average annual arisings, it is expected that around 940 tonnes will be inert/non-hazardous and 200 tonnes will be hazardous waste. During maintenance outages, these periods will generate a higher quantity of wastes than during periods of normal operation. Outage waste quantities have been included in the annual waste arisings.

14.5.35. Typical hazardous wastes likely to be generated would include chemicals, solvents and oils, batteries and electrical equipment from the operation and maintenance of the power station and its infrastructure. Typical inert/non-hazardous wastes are likely to include glass and rubble, office waste and general municipal type wastes such as food, paper and plastics.

14.5.36. Given the current stage of design, only initial estimates are available relating to the quantity of waste arisings likely to be generated during the excavation, construction and operation of the main development and associated developments and (where relevant) the removal of the associated developments. Where quantities have been used these have been estimated from the available drawings or taken as outputs from similar projects. These figures are likely to change as detailed design evolves and more data becomes available. Therefore, these figures should be considered as indicative and are intended for the purpose of ensuring adequate provision is made for storage and management during the various phases of development. They should be reviewed upon availability of more accurate data as the developments progress. Regardless of this, typically operational waste generation is far less than that produced during construction.

14.5.37. Storage would be provided within the operational power station that allows for the segregation of dry recyclable waste and residual waste.

xii) Decommissioning – Sizewell C power station

14.5.38. The decommissioning of Sizewell C power station would be subject to a separate EIA prior to any decommissioning activities commencing and the development of the conventional waste strategy developed for the construction and operation of the power station summarised here has not considered wastes arising from the decommissioning phase.

c) Available waste management facilities

14.5.39. The currently available waste management facilities within 100km of the main development site, along with their capacities are presented in **Table 14.1.**

[6] These dates have been used as a baseline for the period of construction of Sizewell C. These figures are baseline data taken from the Suffolk Minerals and Waste Plan. They are being used as a comparison for the quantity of waste the project is estimated to generate, against that which is typically managed in Suffolk in any one year.

[7] Suffolk Minerals and Waste Local Plan- Suffolk Waste Study (September 2017)–Construction and Demolition Waste Forecast to be managed in permitted facilities to 2036

Table 14.1 Summary of available facilities, site types and capacities within 100 kilometres (km) of Sizewell C

Type of facility	Total capacity/throughput (tpa) in no. of facilities		within 5km	within 10km	within 25km	within 50km	within 75km	within 100km
Landfill	Total capacity	7,224,933	0	0	0	4,368,892	7,224,933	7,224,933
	No. of facilities	5	0	0	0	2	5	5
Transfer	Total capacity	2,252,722	0	99,998	174,997	1,422,483	1,752,477	2,252,722
	No. of facilities	52	0	2	3	26	36	52
Metals	Total capacity	636,990	0	0	149,998	509,991	531,991	636,990
	No. of facilities	15	0	0	2	10	12	15
Biological treatment	Total capacity	378,500	0	0	104,000	268,499	268,500	378,500
	No. of facilities	11	0	0	3	7	8	11
Use in construction	Total capacity	49,999	0	0	0	49,999	49,999	49,999
	No. of facilities	1	0	0	0	1	1	1
Use/ recovery of Inert waste	Total capacity	725,398	0	0	99,999	347,497	597,494	725,398
	No. of facilities	9	0	0	1	5	7	9
Material recycling	Total capacity	374,998	0	0	0	224,999	224,999	374,998
		4	0	0	0	2	2	4
Physical/ Chemical treatment	Total capacity	804,994	0	0	0	724,996	734,994	804,994
	No. of facilities	4	0	0	0	2	2	4
Incineration	Total capacity	4,999	0	0	0	4,999	4,999	4,999
	No. of facilities	1	0	0	0	1	1	1
Hazardous	Total throughput	87,077	0	0	424	22,021	25,792	87,077
	No. of facilities	63	0	0	2	20	40	63

Source: Throughputs from Waste data interrogator – Environment Agency 2017. Capacities from Suffolk Minerals and Waste Local Plan–Suffolk Waste Study.

d) Potential impacts and mitigation

i) Potential impacts

14.5.40. The potential impacts of waste generated as part of the Sizewell C project are currently being assessed. The ongoing assessment considers the local waste management infrastructure (see **Table 14.1** above) and the waste generated over time by the Sizewell C proposals. The potential for any significant effects will be determined at a high level using the information gathered and assessed to date.

14.5.41. The receptors likely to be subject to impacts as a result of waste generation and management are landfills, recycling facilities and other waste management infrastructure.

14.5.42. The potential impacts assessed are:

- utilisation and depletion of the remaining local landfill capacity;
- utilisation of available waste management infrastructure with limited capacities; and

- proximity of waste management facilities to the development sites, in particular, facilities for managing hazardous waste.

14.5.43. The waste assessment will also identify the most likely waste facilities for receipt of different Sizewell C waste streams, taking into consideration proximity to the Sizewell C site as well as the associated development sites, their capacity, feedstock requirements and other parameters. The assessment will also highlight the preferred options for re-use, recycling, treatment and disposal of the various waste streams, in addition to assessing the waste transportation options.

14.5.44. When the likely waste arisings are compared with both the future baselines and the capacities of available facilities, the Sizewell C proposals are considered unlikely to place undue pressure on these facilities. The preliminary conclusion of the assessment is that there would be no significant effects on waste facilities arising as a result of the proposals.

ii) Mitigation

14.5.45. The development of the waste strategy is ongoing and, once completed, the likely impacts on waste infrastructure will be further quantified. Should any likely significant effects be predicted, additional mitigation measures, beyond standard good practice, would be identified in accordance with the waste hierarchy.

14.5.46. The good practice mitigation measures, which may be implemented, include:

- Inclusion of the requirement to use the waste hierarchy, including elimination through design, in all relevant EDF Energy let contracts. Consideration would be given throughout the design phase to minimise the quantity of waste generated and reduce the material requirements within the design itself, through utilising new infrastructure that contains a high proportion of recycled content (where design constraints allow), and by designing to re-use and recycle site-won materials, wherever possible.

- The waste hierarchy would be implemented throughout construction to minimise disposal and maximise re-use and recycling of waste arisings and move waste and material management practices as far up the hierarchy as practicable, minimising the need for disposal. Opportunities for re-use and recycling of waste include (but are not limited to):

  - re-using excavated soils on-site in the landscaping features;
  - chipping green waste on-site for use in the landscaping;
  - composting of green waste;
  - recycling of inert material by crushing, blending and subsequent re-use, as an aggregate;
  - re-using waste on other nearby schemes;
  - re-using waste for uses with clear benefits to the environment, for example in the remodelling of agricultural land or in the restoration of quarries or other excavation sites; and
  - facilities would be provided on-site to segregate waste at source, for example, for recycling.

14.5.47. Where waste must be taken to a recycling or disposal site, the contractor would ensure that the sites have the appropriate permits to ensure that environmental risks are reduced, such as damage to hydrological systems. In addition, the suitable facility would be located as close to the works as possible to minimise the impacts of transportation, in particular, the release of carbon emissions. The contractor would identify the closest and most relevant treatment and disposal sites.

14.5.48. The appointed contractor would produce a Construction Environmental Management Plan which would detail all mitigation measures to be adhered to on-site.

14.5.49. A Site Waste Management Plan (SWMP) would be produced by the appointed contractor, prior to the start of construction. The SWMP would ensure that unavoidable waste is managed in accordance with the waste hierarchy and other relevant legislative requirements and would detail information on the waste carriers and waste management facilities that would be used. The SWMP would be continually reviewed by the appointed contractor and regularly updated with the relevant information as the proposals progress.

14.5.50. A Materials Management Plan (MMP) would be produced by the earthworks appointed contractor to enable the use of excavated materials on-site.

14.5.51. The preparation and implementation of a CEMP, SWMP and MMP would ensure that any likely significant adverse effects associated with material resource use and waste generation are appropriately managed.

e) Completing the assessment

14.5.52. The development of the conventional waste management strategy is ongoing but once complete it will provide details of the estimated waste arisings produced through the various activities as the development progresses. It will also identify methods for managing the wastes.

14.5.53. Where waste is generated, it would be dealt with in a way that follows the waste hierarchy and the proximity principle. The strategy will aim to ensure that all waste management measures employed protect both the environment and people and comply with relevant policies.

14.5.54. As a next step, discussions with waste operators will be required to establish whether closure dates on existing facilities and any potential expansions of capacities might affect the provisional conclusions presented above.

14.5.55. Opportunities to compare this project against other major construction projects in the area may arise and will inform the ongoing assessment as applicable.

14.6. Radiological impact assessment

14.6.1. Levels of radioactivity and the concentration of radionuclides measured in soil, freshwater (groundwater and surface water resources) and marine waters around the main development site are comparable to background levels and well below the levels that would present a hazard to human health.

14.6.2. A preliminary radiological impact assessment has been completed, although since undertaking this study third parties have issued updated data and EDF Energy is currently reviewing this. The preliminary results show that the expected radiological impacts are well below (more than a factor of ten) the relevant dose constraints specified in Schedule 23 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (Ref. 14.10). It is not expected that the revised input parameters will affect the overall conclusions. EDF Energy will report the final radiological impact assessment, including a breakdown of assessment and results, as part of the application for development consent.

14.6.3. The final radiological impact assessment will assess the potential impacts from the proposed development against legally established and recognised radiological protection standards for a specified range of human and non-human receptors. The scope of the final radiological impact assessment is the same as the preliminary assessment including:

- doses from radiological discharges from routine operations;
- external exposure from the site;
- the impact from short-term planned discharges;
- collective doses;
- radiological doses from transport activities;
- environmental concentrations, including build-up of activity from deposition of radionuclides in the environment over the lifetime of the plant; and
- radiological impacts on non-human biota.

14.6.4. Protection of the public in accidental conditions is strictly regulated by the Office for Nuclear Regulation (ONR) under the Nuclear Installations Act 1965 (as amended) (Ref. 14.11). For EDF Energy to operate Sizewell C it must obtain a Nuclear Site Licence and submit a number of nuclear safety cases to the ONR prior to the construction, commissioning and operation of the station to the ONR. These describe in detail the consequences of any accidental event and the mitigation measures in place to prevent, or where this is not possible, to limit the impacts.

14.6.5. EDF Energy will apply for an environmental permit from the regulator, the Environment Agency, for the disposal of radioactive waste from the site. As part of this process the operator will need to describe in detail the design and management controls that are in place through the application of Best Available Techniques (BAT) to keep the radiological impacts from the disposal and discharge of radioactive wastes as low as reasonably practicable (ALARP) as required in the Environmental Permitting (England and Wales) Regulations 2016 (as amended). The operation of the nuclear power station, regulated by the Environment Agency under an environmental permit, would include limits on the radioactive materials that could be disposed of from the site and the conditions that the operator would need to comply with, including the requirement to undertake monitoring, recording and reporting of discharges and their impacts.

14.6.6. The technology and techniques for minimising the discharge of radionuclides into the environment are embedded in the design and specification of the UK EPR™ nuclear reactor that would be used for Sizewell C. The Environment Agency and the ONR carried out a rigorous and in-depth assessment of the reactor design and expressed satisfaction that that it meets high standards and regulatory expectations on safety, security and environmental impact.

14.6.7. It should be noted that no new radioactive materials would be generated during the construction phase for Sizewell C.

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Volume 2 PEI Abbreviations

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Abbreviation	Term
AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
ABI	Annual Business Inquiry
ABCL	Automatic Barrier Crossing Locally Monitored
AD	Associated Development
AES	Annual Employment Survey
AHB	Automatic Half Barrier
AIL	Abnormal Indivisible Load
AIS	Automated Identification System
ALARP	as low as reasonably practicable
ALC	Agricultural Land Classification
AMIE	Archives Monuments Information England
ANPR	Automatic Number Plate Recognition
AOCL+B	Automatic Open Crossing locally monitored with barriers
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AoS	Appraisal of Sustainability
AST	Assured Shorthold Tenancy
ATA	Apprenticeship Training Agency
ATC	Automatic Traffic Counts
AQMA	Air Quality Management Area
B&B	Bed and Breakfast
BAT	Best Available Techniques
BEIS	Department for Business, Energy and Industrial Strategy
bgl	below ground level
BGS	British Geological Survey
BLF	beach landing facility
BMV	best and most versatile
bn	billion
BP	before present
BREEAM	Building Research Establishment Environmental Assessment Method
BRES	Business Register and Employment Survey
BOD	Biological Oxygen Demand
BP	Borrow Pit
CABE	Commission for Architecture and the Built Environment at Design Council

Abbreviation	Term
CCA	Construction Contractor Area
CCP	Code of Construction Practice
CCSM	Chillesford Church Sand Member
CDCZ	Construction Daily Commuting Zone
CDO	Combined Drainage Outfall
DDO	Combined Drainage Outfall
CEEQUAL	Civil Engineering Environmental Quality Award
CES	Census of Employment
CEMP	Construction Environmental Management Plan
CDM	Construction Design and Management
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CGS	County Geodiversity Sites
CHP	Combined Heat and Power
CITB	Construction Industry Training Board
CoCP	Code of Construction Practice
CSM	Conceptual Site Model
CSN	Construction Skills Network
CSMP	Community Safety Management Plan
CTD	Conductivity, Temperature and Depth Sensor
CWS	County Wildlife Site
CWDA	Construction Water Discharge Activity (permit)
CWTP	Construction Worker Travel Plan
DAC	Design Acceptance Confirmation
DBA	Desk Based Assessment
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DEHP	Bis(2-ethylhexyl) phthalate
DfT	Department for Transport
DIN	Dissolved Inorganic Nitrogen
DMO	Destination Management Organisation
DMS	Delivery Management System
DO	Dissolved Oxygen
DMRB	Design Manual for Roads and Bridges
DRS	Direct Rail Services
DWT	Deadweight Tonnage
DWP	Department for Work and Pensions

Abbreviation	Term
ECI	Early Contractor Involvement
ECoW	Ecological Clerk of Works
EDF	Electricité de France
EDG	Emergency Diesel Generator
EEEGR	East of England Energy Group
EEFM	East of England Forecasting Model
EERM	East of England Regional Model
EIA	Environmental Impact Assessment
EMU	Entrainment Mimic Unit
EPR	Evolutionary Pressurised Reactor
EPS	European Protected Species
EQS	Environmental Quality Standards
ES	Environmental Statement
ESL	English as a Second Language
EU	European Union
EQS	Environmental Quality Standard
FDP	Funded Decommissioning Programme
FLO	Fisheries Liaison Officer
FMF	freight management facility
FRA	Flood Risk Assessment
FRR	Fish Recovery and Return
GCSE	General Certificate of Secondary Education
GDA	Generic Design Assessment
GDP	Gross Domestic Product
GEP	Good Ecological Potential
GES	Good Ecological Status
GI	Ground Investigation
GIS	Geographical Information Systems
GRIP	Governance Railway Investment Projects
GSB	Greater Sizewell Bay
GVA	Gross Value Added
GW	Gigawatt
Ha	hectare
HAP	Health Action Plan
HAZID	Hazard Identification
HB	Home based
HCDF	Hard Coastal Defence Feature
HDV	Heavy Duty Vehicle
HE	Historic England

Abbreviation	Term
HER	Historic Environment Record
HGV	Heavy Goods Vehicle
HIA	Health Impact Assessment
HLC	Historic Land Characterisation
HMO	House in Multiple Occupation
HMOs	Houses in Multiple Occupation
HMWB	Heavily Modified Water Body
HRA	Habitats Regulations Assessment
HSA	Health and Safety Authority
HTL	Hold The Line
IAQM	Institute of Air Quality Management
ICES	International Council for the Exploration of the Seas
ICT	Information and Communications Technology
ICAG	Information, Career Advice and Guidance
IDB	Internal Drainage Board
IFCA	Inshore Fisheries and Conservation Authority
ILO	International Labour Organisation
ILW	Intermediate Level Waste
ILWSF	Intermediate Level Waste Storage Facility
IMO	International Maritime Organisation
ISFS	Interim Spent Fuel Store
IROPI	Imperative Reason of Overriding Public Interest
ITIS	Integrated Transport Information System
IPC	Infrastructure Planning Commission
JCP	Jobcentre Plus
JLAG	Joint Local Authority Group
JSA	Jobseekers Allowance
km	kilometre
KPI	Key Performance Indicator
kV	Kilovolt
kW	Kilowatt
LCA	Landscape Character Area
LEEIE	Land to the east of Eastlands Industrial Estate
LEMP	Landscape and Ecology Masterplan
LEP	Local Enterprise Partnership
LGV	Light Goods Vehicle
LiDAR	Light Detection and Ranging
LLW	Low Level Waste

Abbreviation	Term
LOAEL	Lowest observable adverse effect
Lo-Lo	lift-on lift-off
LOOP	Loss of On-site Power
LSE	Likely Significant Effect
LVIA	Landscape and Visual Impact Assessment
m	metre
M bgl	Metres below Ground Level
M&E	mechanical and engineering
MAID	Marine Accident Investigation Branch
MAS	Manufacturing Advisory Service
MCA	Main construction area
MCB	Manually Controlled Barrier
MCB-CCTV	Manually Controlled Barriers with CCTV
MCB-OD	Manually Controlled Barrier with obstacle detection
MCC	Manual Classified Counts
MDS	main development site
MHCLG	The Ministry for Housing, Communities and Local Government
MHWM	Mean High Water Mark
MHWN	Mean High-Water Neap Tide
MHWS	Mean High Water Spring
MMO	Marine Management Organisation
MMP	Materials Management Plan
MOD	Ministry of Defence
MOLF	Marine Offloading Facility
mph	miles per hour
MR	Managed Realignment
MSL	Miniature stop light
MUGA	Multi-Use Games Area
MW	Megawatt
NAI	No Active Intervention
NALEP	New Anglia Local Enterprise Partnership
NAMRAC	Nuclear Advanced Manufacturing Research Centre
NAMTEC	National Metals Technology Centre
NCA	National Character Area
NCA82	National Character Area 82
NCA83	National Character Area 83
NDA	Nuclear Decommissioning Authority
NEET	Not in Education, Employment and Training

Abbreviation	Term
NHB	Non-home based
NIA	Nuclear Industry Association
NERC Act	Natural Environment and Rural Communities Act 2006
nm	nautical miles
NNB	New Nuclear Build
NNR	National Nature Reserve
NMP	National Mapping Programme
NO2	Nitrogen Dioxide
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NPS EN-1	Overarching National Policy Statement for Energy (EN-1)
NPS EN-6	National Policy Statement for Nuclear Power Generation (EN-6)
NRA	Navigation Risk Assessment
NRMM	Non Road Mobile Machinery
NSAN	National Skills Academy for Nuclear
NSIP	Nationally Significant Infrastructure Project
NtM	Notice to Mariners
NTS	National Transmission System
NVZ	Nitrate Vulnerable Zone
ODN	Ordnance Datum (Newlyn)
O-D	Origin-Destination
OEMP	Outline Environmental Management Plan
OGV	Other Goods Vehicle
OND	Office for Nuclear Development
ONR	Office for Nuclear Regulation
ONS	Office for National Statistics
ODN	Ordnance Datum Newlyn
ORR	Office of Rail Regulation
OS	Ordnance Survey
OSC	Operational Service Centre
OWF	Offshore Windfarm
PAH	Polycyclic Aromatic Hydrocarbons
PAS	Portable Antiquities Scheme
PCB	Polychlorinated biphenyls
PCSM	Preliminary Conceptual Site Model
PDZ	Policy Development Zone
PEI	Preliminary Environmental Information

Abbreviation	Term
PHA	Preliminary Hazard Assessment
PHP	Personalised Housing Plan
PINS	Planning Inspectorate
PM_{10}	Particulates
POGO	Power operated gate opener
PRoW	Public Right of Way
PPE	Personal Protective Equipment
PRS	private rented sector
P&R	Park and Ride
PV	Photovoltaic
PWR	Pressurised Water Reactor
RAG	Red Amber Green
RBD	River Basin District
RBMP	River Basin Management Plan
RFID	Radio frequency identification
RHP	Registered Housing Provider
RIGS	Regionally Important Geodiversity Sites
RNLI	Royal National Lifeboat Institution
RNR	Roadside Nature Reserve
Ro-Ro	roll-on roll-off
RSPB	Royal Society for the Protection of Birds
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SAL	Site Action Level
SBIS	Suffolk Biodiversity Information service
SCC	Suffolk County Council
SCCAS	Suffolk County Council Archaeological Service
SCDC	Suffolk Coastal District Council
SCT	Seascape Character Type
SECDB	Suffolk Energy Coast Delivery Board
SEGway	Suffolk Energy Gateway scheme
SCDF	Soft Coastal Defence Feature
SEP	Strategic Economic Plan
SFRA	Strategic Flood Risk Assessment
SIC	Standard Industrial Classification
SLA	Special Landscape Area
SLAF	Suffolk Local Access Forum
SLR	Sea Level Rise

Abbreviation	Term
SMP	Shoreline Management Plan / Soil Management Plan (as appropriate in context)
SO2	Sulphur Dioxide
SOLAS	Safety of Life at Sea
SoCC	Statement of Community Consultation
SoDA	Statement of Design Acceptability
SPA	Suspended Particulate Matter/Special Protection Area
SPZ	Source Protection Zones
SSA	Strategic Siting Assessment
SSA	Spoil Storage Area
SSC	Suspended Sediment Concentration
SSSI	Site of Special Scientific Interest
STEM	Science, Technology, Engineering and Maths
STW	Sewage Treatment Works
SuDS	Sustainable Urban Drainage System
SWMP	Site Waste Management Plan
SWT	Suffolk Wildlife Trust
TAG	Transport Analysis Guidance
TBNNBS	Triple Bar New Nuclear Build Sites
TCA	Temporary construction area
TIMA	Traffic Incident Management Area
TIMP	Traffic Incident Management Plan
TOB	Train crew operated barrier with assistance
TOG	Train crew operated crossing
tpa	throughput
TRO	Total Residual Oxidant
TSS	Traffic Separation Scheme
TWA	Temporary Worker Accommodation
UK	United Kingdom
UKCIP	United Kingdom Climate Impacts Programme
UKCP18	United Kingdom Climate Projections 2018
UK EPRTM	United Kingdom European Pressurised Reactor
UKHO	United Kingdom Hydrographic Office
UWC	User worked crossing
UWC+T	User worked crossing with telephone
UXO	Unexploded Ordnance
VAS	Vehicle Activated Signs
VDV	Vibration Dose Value

Abbreviation	Term
VISSIM/ VISUM	Micro-simulation
WDA	Water Discharge Activities
WDC	Waveney District Council
WFD	Water Framework Directive
WFDA	Water Framework Directive Assessment
WMZ	Water Management Zones
WSI	Written scheme of archaeological investigation
WWII	Second World War
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility
ZVI	(Term as yet unknown)

Glossary

Term	Definition
General	
Aldhurst Farm habitat creation scheme	Land on which a habitat creation scheme has been created to help compensate for any future land-take from the Sizewell Marshes SSSI should Sizewell C be constructed. This land extends from the B1122 Abbey Road in Leiston to Lover's Lane. Permission was granted for the scheme in March 2015 and it has now been created.
application for development consent	The application to construct and operate Sizewell C. The term 'DCO application' should not be used.
existing Sizewell power station complex	The existing Sizewell A and B power stations together.
landscape strategy	The landscape strategy seeks to restore and enhance those areas subject to construction of the power station and enhance those remaining areas across the wider EDF Energy Estate.
proposed development	Should be used to describe the subject of that chapter. For example, in volume 2, chapter 1 it should be used to refer to the power station whilst in volume 3, chapter 13 it should be used to refer to the park and ride facility. The term will be clearly defined in the introductory chapter to the relevant site.
site	As above, should be used to describe the particular site under consideration within that volume. For example, in volume 2, chapter 1 "site" should be used to refer to the site for the construction/operation of the power station whilst in volume 3, chapter 13 it should be used to refer to the site for the construction/operation of the park and ride facility. A clear definition will be provided in the introductory chapter to the relevant site.
Sizewell A / Sizewell A power station	The existing Sizewell A power station and associated infrastructure, located to the south of the existing Sizewell B power station and the location of the proposed Sizewell C power station platform.
Sizewell B / Sizewell B power station	The existing Sizewell B power station and associated infrastructure, located to the south of the location of the proposed Sizewell C power station platform.
Sizewell C / Sizewell C power station	The proposed power station to be located to the north of the existing Sizewell A and Sizewell B power stations.
the Project	To be used when referring to the development as a whole. The term 'Sizewell C Project' can be used for clarity when required, for example when talking about other projects/plans. The terms 'SZC Project' and 'SZC' etc. should not be used.
Main development site	
accommodation campus	Would be located in the north-west of the main development site and take the form of modular blocks, with car parking, residential and recreational facilities. Sports facilities will now be located off-site likely in Leiston.
beach landing facility (BLF)	Proposed to be located to the north-east of the power station platform and is likely to take the form of a concrete structure embedded into the sea defences with a road running around the northern foot of the northern mound, connecting it to the power station platform. During periods of use the facility would be uncovered and the sand and shingle in front of the facility would be dredged to allow an access channel for the required ship. The excavated material would be replaced after use.
borrow pit	To allow for the extraction of existing sands and gravel for use as backfill material for the main construction. The pits would then be filled with excavated materials that are unsuitable for re-use in construction (principally the peaty materials). To be located at the north-west of the temporary construction area.
cooling water intake(s) **cooling water outfall(s)** **(collectively referred to as 'cooling water infrastructure')**	Two intake tunnels (one associated with each unit) each with one or two intake heads and one discharge tunnel with two outfall heads. The intake and outfall heads would be situated seaward of the Sizewell-Dunwich Bank, around 3km (subject to final engineering design) from the power station. The cooling water tunnels would be constructed beneath the foreshore and sea floor by tunnel boring machines operating from the landward side.
foreshore works	The works undertaken in the corridor to the east of main platform for the construction of the initial phase of the sea defence, the BLF with the associated access road and the permanent sea defence.
land east of Eastlands Industrial Estate (LEEIE)	Land to the east of the Eastlands Industrial Estate, which is directly north of Sizewell Halt, would be used to support construction on the power station platform and temporary construction area (for location see the illustrative plan at 2.3 below). The term 'Big Field', used as short-hand by EDF Energy and others, should not be used in any of the consultation documents.
main development site (MDS)	The total area needed for constructing the Sizewell C power station and made up of the power station platform, the temporary construction area and the land east of Eastlands Industrial Estate (for location see the illustrative plan at 2.3 below).

Term	Definition
power station platform (main platform)	The area that will become the permanent power station. The permanent features include: two UK EPR comprising of reactor buildings and associated buildings; turbine halls and electrical buildings; cooling water pumphouses and associated buildings; an operational service centre; fuel and waste storage facilities; external plant including storage tanks; internal roads; ancillary buildings, offices and storage facilities; drainage infrastructure and National Grid 400kV Substation and one National Grid pylon (for location see the illustrative plan at 2.3 below).
post-operational phase	Once construction of the power station is complete, it is anticipated that the associated developments will no longer be required by EDF Energy. This stage is referred to as the post-operational phase.
Rochdale Envelope	The 'Rochdale Envelope' approach is employed where the nature of a proposed development means that some details of a project have not been confirmed (for instance the precise dimensions of structures) when an application is submitted, and flexibility is therefore sought to address uncertainty.
temporary construction area	The area within the main development site located primarily to the north and west of the SSSI crossing. This would be used to support construction activity on the power station platform. This would include the accommodation campus, borrow pit fields, contractors' compounds, site management facilities, entrance plaza, on-site car parking and the green rail route east of B1122 after it has crossed the redline into the temporary construction area (for location see the illustrative plan at 2.3 below).
Associated development	
A12/B1122 Yoxford roundabout	Roundabout at junction of the B1122 with the A12 at Yoxford. Presented as an option at Stage 2 (Option 1 of 2, chosen in preference to a signalised junction).
associated development(s)	Temporary development which is associated with a Nationally Significant Infrastructure Project (NSIP), as defined by the Planning Act 2008. What this includes is different under the rail-led strategy and the road-led strategy. See table at 2.2 below. Road improvements would be associated development but would be permanent.
East Suffolk Line	The railway line which runs hourly (Monday to Saturday and every other hour on Sundays) from Ipswich to Lowestoft passing through Wickham Market, Saxmundham and Darsham. Under the rail-led strategy this line will accommodate up to five freight trains per day when the green rail route is operational. Upgrade works on this line include a passing loop, signalling upgrades, track crossover at Saxmundham, level crossing works and bridge strengthening works. Under the road-led strategy this line will accommodate up to two freight trains per day. EDF Energy is working with Network Rail to identify upgrades needed under the road-led strategy.
freight management facility	This is only proposed as part of the road-led strategy. It is an area to manage HGV movements coming to the main development site from the south. A number of options of potential sites will be presented at Stage 3 but the specific sites are yet to be confirmed. Options were proposed in Stage 1 but this proposal was not included in Stage 2.
green rail route	Presented in Stage 2 and now only proposed as part of the rail-led strategy. This new branch line off the existing Saxmundham to Leiston line will be used to support up to five freight deliveries per day (ten movements). It would run from Saxmundham Road to Buckleswood Road; Buckleswood Road to B1122 (Abbey Road); and B1122 (Abbey Road) into the temporary construction area.
northern park and ride – Darsham	The northern park and ride site would require around 1,250 car parking spaces, together with other facilities and infrastructure to operate the park and ride, as well as on-site spoil storage areas from the construction of the facility. In Stage 2 access to the Darsham site was from the south, in this Stage 3 the proposed access is from a new roundabout north of Willow Marsh Lane.
other highway improvements	4 were proposed at Stage 2. Which works would be carried out in the early years of the rail-led strategy or the road-led strategy is still to be confirmed. These are the proposals presented in Stage 2 which may be taken forward: Mill Street – improvement to the B1122 to the west of the junction with Mill Street, near Middleton Moor–reducing the road level to the west of the junction would improve forward visibility for traffic on the B1122 and help traffic exiting Mill Street. Pump Cottages / Theberton / Theberton South – pedestrian enhancements including pedestrian crossing and footpath near Pump Cottages (provision of a new footpath on the eastern side of the B1122 that connects to the existing footpath and a new pedestrian crossing on the B1122 near Theberton, Pump Cottages)
rail-led strategy	The preferred proposal for transporting construction material to the main development site. A rail-led strategy will allow for up to 5 freight trains a day and 225 HGVs average at peak with 450 HGVs on the busiest day. HGVs will only operate between 7.00 and 23.00. This strategy includes the two village bypass, A12/B1122 Yoxford roundabout and Theberton bypass. The green rail route would allow trains to go directly to the temporary construction area. This strategy also includes upgrades to the East Suffolk Line and the Saxmundham – Leiston branch line and Sizewell Halt. Use of the beach landing facility for AILs is also part of this strategy.

Term	Definition
road-led strategy	In the event that the rail-led strategy is not deliverable in time, a road-led strategy would be proposed. A road-led strategy will allow for up to 2 freight trains a day and 375 HGVs average at peak with 750 HGVs on the busiest day. HGVs will be able to operate for extended hours. This strategy includes the two village bypass and A12/B1122 Yoxford roundabout. The Theberton bypass would be built as part of the Sizewell link road which would be south of the B1122 and travel from the A12 to the main development site. Additionally, a freight management facility would be included on A12/A14 junction near Ipswich. The limited use of rail only allows for upgrades to the Saxmundham – Leiston branch line and Sizewell Halt. Use of the beach landing facility for AILs is also part of this strategy.
Sizewell link road	New road which would bypass the B1122 with a new single carriageway road to the south west. Once operational, the bypass would form a new section of the B1122. The proposed route runs approximately 6.8 km across predominantly agricultural land to the south west of the existing B1122. The bypass would be a single carriageway 7.3m wide with 1m hardstrips and 2.5m verges. The side roads would be approximately 6m in width, with the exception of the new connections to the B1125 and to the B1122 west of Middleton Moor, which would be 7.3m wide. This would only be required in the road-led strategy whereas the smaller Theberton bypass (which forms part of the route of the longer Sizewell link road) would be required in the rail-led strategy.
southern park and ride – Wickham Market	The southern park and ride site would require around 1,250 car parking spaces, together with other facilities and infrastructure to operate the facility, as well as on-site soil storage areas from the construction of the facility. The site has changed since Stage 1, with the redline boundary moving to the fields adjacent to the eastern boundary of the original site.
Theberton bypass	New road which would bypass the village of Theberton with a new single carriageway road to the west. Once operational, the bypass would form a new section of the B1122. The proposed route runs approximately 2.6km across predominantly agricultural land to the west of the existing B1122, departing the B1122 via a new section of road that starts at the existing junction with Hawthorn Road and Annesons Corner and re-joins the B1122 approximately 420m south of the existing junction with Moat Road and Onner's Lane. The bypass would be a single carriageway 7.3m wide with 1m hardstrips and 2.5m verges. The side roads would be approximately 6m in width, with the exception of the new connection to the B1125, which would be 7.3m wide. This is a stand-alone development under the rail-led strategy but would also form part of the Sizewell link road under the road-led strategy.
two village bypass	New road which would bypass the villages of Farnham and Stratford St Andrew with a new single carriageway road to the south. Once operational, the bypass would form a new section of the A12. The proposed route runs approximately 2.4km across predominantly agricultural land to the south of the existing A12, departing the A12 to the west of Stratford St Andrew via a new three arm roundabout near Parkgate Farm and re-joining the A12 with a second roundabout to the east of Farnham at the A12/A1094 Friday Street junction. The bypass would be a single carriageway 7.3m wide with 3.5m verges. The side roads would be approximately 6m in width. This was presented as option 4 at Stage 2. This is proposed for both a rail-led or road-led strategy.
upgrades to Sizewell Halt	Upgrade of the existing rail facility to the east of Leiston, to facilitate its use as the primary rail delivery point in the early years of the power station construction programme.
upgrades to the existing Saxmundham-Leiston branch line	Proposed under rail-led strategy and road-led strategy. The existing track would be repaired or replaced to the standard required for freight transport and works will be carried out on the level crossings.
EIA and related assessment terms	
Additional mitigation	This is often referred to as 'secondary mitigation' and includes actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent or through inclusion in an ES topic chapters (e.g. describing certain lighting limits, which will be subject to the submission of a detailed lighting layout as a condition of approval; commitment to the implementation of an archaeological watching brief).
Additive impacts	These arise when impacts from the Project combine with impacts from other planned/potential third party development projects (normally in the vicinity of the site), resulting in a change to the overall impact and resulting effect.
Agricultural Land Classification (ALC)	A classification of agricultural land in England and Wales according to its quality and agricultural versatility. The classifications range from Grade 1 (the best and most versatile), through Grades 2, 3a, 3b, 3c and 4, down to Grade 5 (the least versatile).
Alongshore Transport	Movement parallel to the coastline.
Anchorage	An area off the coast that is suitable for a vessel to anchor.
Annex I Habitats	Habitats listed in Annex I of the Conservation of Habitats and Species Regulations 2010 (SI 2010/490) (as amended).

Term	Definition
Anthropogenic	Man-made.
Appropriate Assessment (AA)	A process required by the Habitats Directive 92/43/EEC to avoid adverse effects of plans, programmes and projects on Natura 2000 sites and thereby maintain the integrity of the Natura 2000 network and its features.
Area of Outstanding Natural Beauty (AONB)	AONBs were formally designated under the National Parks and Access to the Countryside Act 1949 to protect areas of the countryside of high scenic quality that cannot be selected for National Park status due to their lack of opportunities for outdoor recreation (an essential objective of National Parks). Further information on AONBs can be found at www.aonb.org.uk
Baseline	The environmental conditions, resources and receptors that currently exist on the site and in the surrounding area.
Bathing Water Directive Quality Standards	The microbial standards for water quality at popular beaches and inland bathing sites.
Bathymetry	The 'topography' of the seabed.
Berth	A designated location where a vessel may be moored.
Biodiversity Action Plan (BAP)	An agreed plan for a habitat or species, which forms part of the UK's commitment to biodiversity. For further information consult the BAP website: www.ukbap.org.uk
Birds Directive	European Community Directive 2009/147/EC (which codified Directive 79/409/EEC) on the conservation of wild birds. In the UK the Directive is implemented via the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2010 (SI 2010/490) (as amended).
Bivalve	Marine or freshwater mollusc whose body is enclosed between two shells hinged together by a ligament on the dorsal side of the body.
British Energy (BE)	British Energy delisted from the London Stock Exchange on 3 February 2009 and is now part of EDF Energy.
Cetaceans	Marine mammals such as dolphins and porpoises.
Commissioning	Commissioning of a reactor involves a series of tests to demonstrate, to the extent practicable, that the plant, as built and including all components and systems, is capable of safe and reliable operation in accordance with its design specification, performance objectives and safety requirements.
Conservation Areas	Designated areas of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance.
Contaminated Land	Land where there may be a presence on site of a noxious substance, which may give rise to a hazard.
Conventional Island	Turbine halls and electrical buildings forming part of the UK EPR.
County Wildlife Site (CWS)	Areas identified and selected for their local nature conservation value.
Cross-shore	On or across the shore.
Cumulative effects	Cumulative effects arise when impacts from the proposed development combine with impacts from other planned / potential third party plans or projects (normally in the vicinity of the site), resulting in a change to the overall magnitude of impact acting on a receptor and potentially a change in the resulting effect.
Cut-off wall	In order to excavate to a sufficient depth for the foundations of the power station buildings, it will be necessary to construct a cut-off wall to isolate the excavation from the surrounding hydrological environment.
Decibel (dB)	A unit specifying the logarithm of the ratio between the value of a quantity and a reference value (usually used in the measurement of power and intensity). For sound pressure level the reference quantity is 20μPa, which is the threshold of normal hearing (0 dB). 140 dB is the threshold of pain.
Decommissioning	At the end of its operational life, the power station buildings, other than the Interim Spent Fuel Store (ISFS) and the Intermediate Level Waste (ILW) building, would be removed. The process that is required to do this is known as decommissioning.
Diamicton	Glacial till.
Disturbance	A perturbation in the system (either biological, e.g. predation or physical, e.g. storms) which alters the nature of the biological community.
Drift Nets	Drift netting is a fishing technique where nets, called drift nets, are allowed to float freely at the surface.
EDF Energy	NNB Generation Company (SZC) Limited, whose registered office is at 90 Whitfield Street, London, W1T 4EZ (referred to in this document as 'EDF Energy').

Term	Definition
EDF Energy Estate	Land owned by EDF Energy in the Sizewell area.
Effects	Are defined as the consequences of impacts. For example, the opening of new views towards the new bypass or a change in the perception of a local landscape character.
Embedded mitigation	This is often referred to as 'primary mitigation' and includes modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, become a fundamental part of the design for which consent is sought, and do not require additional action to be taken (e.g. architectural treatment of proposed facilities to be in keeping with similar adjacent buildings in its external appearance; reduction in the height of a building to reduce visual impact; identifying a key habitat that should remain unaffected by the development's layout and operation e.g. retaining a hedgerows as bat foraging routes; developing a transport strategy that reduces trips, avoiding the need for junction improvements).
Entrainment	Term used to describe the passage of marine organisms small enough to go through the cooling water filtration screens through the power station cooling water circuit and then discharged to sea.
Environment Agency	A Government Agency responsible for matters relating to contaminated land, waste management, surface water drainage and discharges, flood risk management and water quality and has responsibility for ensuring that new nuclear power station designs meet high environmental standards and use the Best Available Techniques (BAT) to achieve this.
Environmental Impact Assessment	Generically, a process for predicting the effects of a proposed development on the environment that informs decision-makers in relation to planning permissions, consents, licences and other statutory approvals, as required by European Union Directive 2011/92/EU (which codified Directive 85/337/EEC) (the EIA Directive).
Environmental Statement	The document reporting the process and outcomes of the EIA.
Fauna	Animals
Fish Recovery and Return (FRR)	A system specifically designed to remove fish from the cooling water system and return them, in good condition, to the sea. Such systems have now been in use for many years: an early version is already in place at Sizewell B and was specifically designed to return juvenile sole quickly to sea, although the measured survival of other species is high also. Given the risk of damage due to turbulence, shear, pressure and physical impact this type of system only succeeds well for more robust species such as flatfish and eel
Future baseline	The situation that would occur in the absence of the proposed development. Predicted impacts are compared against this theoretical scenario. It is typically based upon extrapolating the current baseline forward using technical knowledge of changes which may occur.
Geological Disposal Facility	Disposal underground at a depth of more than about 200 metres (also called "deep geological disposal"). The depth is chosen so as to provide a barrier against the escape of radioactivity and protect the waste from disturbance. This disposal method is appropriate for high level and intermediate level wastes.
Geomorphology	The scientific study of landforms and the processes that shape them through an understanding of landform history and dynamics (in particular their nature, origin, processes of development and material composition).
Gravity Model	Developed to estimate where non-home-based workers would choose to live and where home-based workers would travel from.
Gross Value Added (GVA)	Gross Value Added measures the value of goods and services produced in a geographical area, industry or economic sector. It is a measure of economic productivity, calculated by valuing the amount of goods and services that have been produced, less the cost of all inputs and raw materials that are directly attributable to that production.
Groundwater	Water occurring below ground in natural formations (typically rocks, gravels and sands).
Habitats Regulations Assessment (HRA)	An assessment to determine compliance of a plan or project with the Habitats Directive (94/43/EEC) and Conservation of Habitats and Species Regulations 2010 (as amended).
Habitats Directive	The Habitats Directive (more formally known as Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora) is a European Union Directive adopted in 1992 as a response to the Berne Convention. It is one of the EU's two directives in relation to wildlife and nature conservation (the other being the Birds Directive). It aims to protect over 200 habitats and approximately 1,000 animal and plant species listed in the Directive's Annexes. Annex I covers habitats, Annex II covers species requiring designation of special areas of conservation, Annex III covers the criteria for selecting sites eligible for identification as sites of community importance and designation as special areas of conservation, Annex IV species in need of strict protection and Annex V covers species whose taking from the wild can be restricted by European law. These are species and habitats which are considered to be of European interest, following criteria given in the Directive. The Directive led to the setting up of a network of Special Areas of Conservation which, together with the existing Special Protection Areas, form a network of protected sites across the European Union called Natura 2000.

Term	Definition
Health and Safety Executive (HSE)	A non-departmental public body, which is responsible for the encouragement, regulation and enforcement of workplace health, safety and welfare, and for research into occupational risks in England and Wales and Scotland.
Historic England	A Government Agency which promotes conservation and understanding of the historic environment and advises Government on the selection of listed buildings and scheduled monuments for protection and provides grant aid for the maintenance of historic buildings and monuments.
Hold the Line	One of several policy options that may be identified for separate lengths of coastline under the Shoreline Management Plan (SMP) (q.v.). A 'hold the line' policy chooses to provide some level of coastal defence, keeping the position of the defence approximately where it is now. This does not automatically mean that defences will be improved to counteract climate change as this will be considered in more detail by Flood Risk management strategies and individual defence schemes. Other such policies in include 'no active intervention' and 'managed realignment'.
Impact	Are defined as the changes resulting from an action. For example, a new bypass development and the local landscape as the sensitive environmental resource. Here an impact (the change arising from the development's progression) could be the permanent loss of mature trees and hedgerows.
Impingement	Term used to refer to the fish and other marine species becoming trapped on cooling water filtration screens.
Informal Recreation	Leisure activities which are not undertaken on a formal, organised basis and are generally carried out by individuals or small groups on an intermittent basis with a minimal requirement for supporting facilities.
Inter-relationship effects	Effects that occur when different individual environmental impacts of the proposed development combine together synergistically to influence particular receptors and have the potential to lead to significant effects. If considered in isolation the individual environmental impacts may not lead to significant effects.
Intertidal	The area of shore between the highest and lowest tides.
Ionising Radiation	Radiation, such as alpha, beta, gamma and x-rays, capable of inducing certain changes and effects in materials of living tissues.
Landscaping	A general term used for the means by which, where appropriate, development is made to fit visually into its surroundings by control of siting and layout and use of trees, shrubs or grass (soft landscaping) and/or fences, walls or paving (hard landscaping).
LiDAR	Light Detection and Ranging–a device used to measure distance to, or other properties of, a target.
Listed Buildings	Buildings and structures which have been identified by the Secretary of State for Culture, Media and Sport as being of special architectural or historic interest and whose protection and maintenance are the subject of special legislation. Their curtilage and setting is also protected. Listed building consent is required before any works can be carried out on a listed building.
Longlines	Longline fishing is a commercial fishing technique that uses a long line with baited hooks attached at intervals by means of branch lines.
Managed realignment	One of several policy options that may be identified for separate lengths of coastline under the Shoreline Management Plan (SMP) (q.v.). A 'managed realignment' policy allows managed landward movement of defences, giving up some land to the sea to form a more sustainable defence line in the future. This option may create additional habitat such as mud flats or saltmarsh which provide a natural flood risk defence.
Marine Environment	Anything below the mean high water mark.
Mitigation	Measures recommended through the EIA process and applied through the regulatory approvals process to avoid, reduce or, where appropriate, to offset significant adverse effects on the environment
Morphology	Shape or form.
National Grid	National Grid run and operate the high voltage electric power transmission network in Great Britain, connecting power stations and major substations and ensuring that electricity generated anywhere in Great Britain can be used to satisfy demand elsewhere.
National Nature Reserve (NNR)	National Nature Reserves are defined under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981 (as amended) as land primarily for nature conservation. Such a purpose covers the study, research and preservation of flora, fauna and sites with special geological or physiographical features. The NNRs were established to protect the most important areas of wildlife habitat and geological formations in Britain and as places for scientific research. All NNRs are nationally important and are best examples of a particular habitat/ecosystem.
Natural England	A Government Agency that promotes the conservation of England's wildlife and natural features and is responsible for designating National Nature Reserves, identifying Sites of Special Scientific Interest and for advising a wide range of bodies and individuals including the Government on matters affecting nature conservation.
Nearshore	In the sea, but close to the shore.

Term	Definition
No Active Intervention	One of several policy options that may be identified for separate lengths of coastline under the Shoreline Management Plan (SMP) (q.v.). A 'no active intervention' strategy assumes that no investment in the maintenance, repair or replacement of existing defence structures takes place. It is a 'do nothing' scenario against which different policies can be tested but it is also a viable policy for some stretches of shoreline e.g. where there is a low risk of flooding or erosion now or in the future.
NPS EN-1	Overarching National Policy Statement for Energy (July 2011) published by Department for Energy and Climate Change pursuant to Section 5(9) of the Planning Act 2008
NPS EN-6	National Policy Statement for Nuclear Power Generation (July 2011) published by Department for Energy and Climate Change pursuant to Section 5(9) of the Planning Act 2008
Nuclear Island	National Policy Statement for Nuclear Power Generation (July 2011) published by Department for Energy and Climate Change pursuant to Section 5(9) of the Planning Act 2008
Ordnance Datum (Newlyn) (ODN)	The UK reference point for height.
Passive Gear	An umbrella term for all fishing methods with static fishing gear in the water, such as lobster pots.
Piling	The installation of bored and driven piles and the effecting of ground treatments by vibratory dynamic and other methods of ground stabilisation.
Plankton	Organisms suspended in the water column and incapable of moving against water currents.
Potable Water	Drinking water.
Pressurised Water Reactor (PWR)	A type of nuclear power reactor.
Principal Aquifer	Layers of rock or deposits with high permeability that provide a high level of groundwater storage.
Public Access	Permitted use of land by members of the public. Access can be allowed by a variety of means including: public rights of way (e.g. footpath, bridleway, byway); Acts of Parliament; the granting of conditional access by landowners (e.g. National Trust); custom or tradition.
Public Rights of Way (PRoW)	These are designated 'highways' under the Countryside and Rights of Way [CRoW] Act 2000, which the public can use at any time.
Radionuclide	Any man-made or natural element which emits radiation in the form of alpha or beta particles, or as gamma rays.
Ramsar Site	The Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat (1971) imposes a requirement on the UK Government to promote the wise use of wetlands and to protect wetlands of international importance. This includes the designation of certain areas as Ramsar Sites, where their importance for nature conservation (especially with respect to waterfowl) and environmental sustainability meet certain criteria. Further information can be found on the RAMSAR convention on wetlands website: www.ramsar.org
Receptor	Used to refer to human beings that may be affected by changes arising due to the development and the socio-economic systems on which they depend. These can be reflected individually or collectively. For example, Resident, employees, communities.
Relocated Facilities	Sizewell B own and operate several buildings which are located on the Sizewell C main development site. To release the land for Sizewell C, Sizewell B will relocate these facilitates. It is proposed that these facilities are relocated to the Sizewell B compound or to land currently owned by Sizewell A. This decision is tbc.
Resources	Defined as bio-physical features or items of 'environmental capital'. For example, species and their habitats, aquifers, access routes and community facilities.
Scheduled Monument	A feature of national, historical or archaeological importance, either above or below the ground, which is included in the schedule of monuments as identified by the Secretary of State. Not all nationally important archaeological remains are scheduled and sites of lesser importance may still merit protection.
Sea protection and flood defence (sea defences)	The integrated coastal protection and flood defences are a set of hard and soft engineering features designed to safeguard the station during periods of elevated water levels on the coast (e.g. from storm surges and high waves).
Secondary Aquifer	Layers of rock or deposits providing lower levels of groundwater storage than a Principal Aquifer.

Term	Definition
Shoreline Management Plan (SMP)	A SMP is a non-statutory document containing policies that suggest how specific lengths of shoreline should be managed over the next 100 years. It follows from a large scale assessment of the risks associated with coastal processes which seeks to reduce these risks to people and the developed, historic and natural environments. On the basis of technical studies and consultation, one of several policy options are chosen for each time period (epoch) covered by the SMP: 0-20, 20-50 and 50-100 years: we are currently half way through the first of these 'epochs'. The current version of the SMP for the area around Sizewell may be found at: http://www.suffolksmp2.org.uk/ and covers the coast from Lowestoft Ness to Felixstowe Landguard Point. This most recent version was formally adopted by the operating authorities and published in 2012.
Site of Special Scientific Interest (SSSI)	An area designated as being of special interest by reason of any of its flora, fauna or geological or physiographical features. SSSIs are designated by Natural England under the Wildlife and Countryside Act 1981 (as amended) and the Countryside and Rights of Way Act 2000.
Source Protection Zones (SPZ)	Defined by the Environment Agency, these zones show the risk of contamination from any activities that might cause pollution in the area.
Spatial scope	An area over which a significant change to the environment may occur.
Special Area of Conservation (SAC)	A site designated via the European Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC)) (i.e. the Habitats Directive) to protect rare and endangered habitats and species at a European level. Together with SPAs they form a network of European sites known as Natura 2000.
Special Protection Area (SPA)	Designated under Article 4 of the European Directive on the Conservation of Wild Birds (2009/147/EC) (i.e. the Birds Directive) to protect the habitats of threatened and migratory birds.
Subtidal	Areas below water at all states of tide.
Suffolk Heritage Coast	Areas of coast that are managed to conserve their natural beauty and, where appropriate, to improve accessibility for visitors.
Surface Water	Terrestrial water bodies that are found above ground level, such as lakes, rivers and ditches, and including fresh and inland brackish water.
Temporary scope	The timeframe over which the environmental impact assessment is undertaken.
Tertiary mitigation	Will be required regardless of any EIA assessment, as it is imposed, for example, as a result of legislative requirements and/or standard sectoral practices. For example, applying emission controls to an industrial stack to meet the requirements of the Industrial Emissions Directive (Directive 2010/75/EU); those measures contained within the Code of Construction Practice/Construction Method Statement that have been reviewed and agreed).
Trammel Net	Fishing net with three layers of netting that is used to entangle fish or crustaceans.
UK EPR	The third generation Pressurised Water Reactor design. It has been designed and developed mainly in France and Germany. In Europe this reactor design was called the European Pressurised Reactor and the international name of this reactor is Evolutionary Power Reactor, but is now referred to as EPR.
Water Framework Directive (WFD)	European Community Directive (2000/60/EC) on integrated river basin management. The WFD sets out environmental objectives for water status based on: ecological and chemical parameters; common monitoring and assessment strategies; arrangements for river basin administration and planning; and a programme of measures in order to meet the objectives. For further detail consult the European Commission website: http://europa.eu.int
Waterfowl	Wading birds and wildfowl.
Zone of Influence	The maximum geographical area around the main development site and off-site associated development where there is a potential for impacts to occur.
Zone of theoretical visibility	The likely (or theoretical) extent of visibility of a development, usually shown on a map.