The Sizewell C Project

8.14 Water Framework Directive Compliance Assessment Report Addendum

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EXECUTIVE SUMMARY

SZC Co. has identified a series of proposed design changes following submission of the DCO application for the Sizewell C Project in May 2020. This report provides information to support the assessment of whether the proposed changes to the design of the Sizewell C Project change the conclusions of the **Water Framework Directive (WFD) Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623] that was submitted as part of the DCO application.

An initial screening assessment demonstrated that the majority of the proposed design changes would not result in additional impacts which could affect water body status or change the conclusions of the **Water Framework Directive (WFD) Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623]. However, further assessment of the potential impacts of proposed changes to the design of the permanent BLF, construction and operation of a new BLF, changes to design of the SSSI crossing and the addition of a new area of fen meadow habitat creation at Pakenham was undertaken. This assessment demonstrated that the proposed design changes would not result in any deterioration in water body status, impacts on RBMP mitigation measures, impacts on Protected Areas or additional cumulative impacts. No changes to the conclusions of the **Water Framework Directive (WFD) Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623] were therefore identified.

This report also provides a summary of additional information that has been prepared since submission of the DCO application. This includes:

- an assessment of the implications of updates to WFD water body classification in 2020, which concluded that this would not affect the conclusions of the **Water Framework Directive (WFD) Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623];
- updates to the assessment of potential impacts on fish impingement and entrainment, which concluded that there would be no deterioration in water body status;
- an updated assessment of the potential impacts of fen meadow habitat creation, which corrected the location of these features and found no adverse impacts on affected water bodies; and
- an initial assessment of the impacts of water supply to the Sizewell C Project during construction and operation. This found that the proposals would not result in deterioration in water body status, prevent the implementation or counteract the effects of mitigation measures identified in the RBMP, or adversely affect Protected Areas linked to the water bodies.

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1 INTRODUCTION

1.1.1 NNB Generation Company (SZC) Limited (SZC Co.) submitted an application for a Development Consent Order (DCO) to the Planning Inspectorate under the Planning Act 2008 for the Sizewell C Project (referred to as the 'Application') in May 2020 (Ref. 1). The Application was accepted for examination in June 2020.

1.1.2 Since the submission of the Application, SZC Co. has continued to engage with the local authorities, environmental organisations, local stakeholder groups and the public to gather their responses to the Application. This process has identified potential opportunities for changing the Application to further minimise impacts on the local area and environment in many cases, whilst reflecting the further design detail that has come forward in preparation for implementation of the Sizewell C Project.

1.1.3 In addition to the proposed changes, SZC Co. has continued to develop the detail of its proposals and of the implementation of the Sizewell C Project (the 'project'), and has undertaken some additional environmental assessment work in response to continuing engagement with stakeholders. This 'Additional Information' adds to the information supporting the Application and should assist interested parties in their understanding of matters.

1.1.4 The proposed changes and the Additional Information are described and assessed in a number of updates and Addenda to the originally submitted application documents.

1.1.5 This report provides information to support the assessment of whether the proposed changes to the design of the project are compliant with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (SI 2017/407) (Ref.2). This is presented in **Section 2**. **Section 2** should therefore be read in conjunction with **Parts 2**, **3** and **4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623], which were provided in support of SZC Co. Application for the Sizewell C Project.

1.1.6 This document also provides a summary of Additional Information that has been prepared since submission of the Application. This includes an assessment of the implications of updates to WFD water body classification in 2020, updates to the assessment of potential impacts on fish impingement and entrainment, an updated assessment of the potential impacts of fen meadow habitat creation and an initial assessment of the impacts of water supply to the Sizewell C Project during construction and operation, and is presented in **Section 3**.

2 WFD COMPLIANCE OF PROPOSED DESIGN CHANGES

2.1 Proposed design changes

2.1.1 As a result of ongoing discussions with stakeholders and project contractors, SZC Co. have identified a number of design changes to further reduce impacts on the local area and maximise project construction efficiency.

2.1.2 Full details of these changes are provided in **Part 1 Chapter 2** (Doc Ref. 8.19) and in the **Environmental Statement Addendum** (Doc Ref. 6.14). This section includes an initial screening exercise to determine whether the proposed changes would alter the conclusions of the **Parts 2**, **3** and **4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623] and result in potential non-compliance with the requirements of the WFD (**Section 2.2**). Where potential changes to the conclusions have been identified, further assessments have been undertaken and are presented in **Sections 2.3** to **2.5**.

2.2 WFD compliance of design changes: Screening

2.2.1 A brief summary of each proposed design change is presented in **Table 2.1**, alongside a comment regarding the potential implications of the change for WFD compliance and the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].

Table 2.1: Screening of WFD implications of proposed design changes

Design change	Outline description	WFD implications
Change 1: Potential to increase the frequency of freight train movements to facilitate bulk material imports by rail	Changes to the frequency of freight train movements using the rail infrastructure.	The operational use of the rail infrastructure was considered in **Section 3.10** of **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622],which concluded that the measures set out in the Outline Drainage Strategy would prevent impacts on the hydromorphology and physico-chemistry of the Leiston Beck river water body (GB105035046271) and the chemistry of the Waveney & East Suffolk Chalk and Crag groundwater body (GB40501G400600) This change would not alter the frequency or quality of drainage or affect the rail infrastructure itself. This change will not, therefore, alter the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] and are not assessed further.
Change 2: An enhancement of the permanent beach landing facility and construction of a new, temporary beach landing facility	To increase the amount of Abnormal Indivisible Loads that could be delivered by sea during construction, it is necessary to make the seabed in front of the permanent BLF better able to receive more regular deliveries by barge without requiring additional maintenance works. The current design limits the permanent BLF's capacity to receive more regular deliveries. The proposed change would add a grounding platform (also known as grillage), which is assumed to be made of a combination of concrete, timber and steel, or similar. It would protrude above bed level by less than a metre and shallow foundations are assumed to be embedded into the sea bed. The seabed would be graded by plough dredging or similar non-removal technique to a roughly level surface before laying the platform.	The construction and construction-phase operation of a new temporary BLF could potentially impact upon the hydromorphology, physico-chemistry and biology of the coastal water body and change the conclusions of **Sections 2.5j)** and **2.5o)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]. The WFD implications of this change will, therefore, be considered in more detail in **Section 2.3**.

Design change	Outline description	WFD implications
	Dredged material would not be removed from the sea and would be placed in close proximity to the BLF. To reduce the amount of construction material that would otherwise need to be delivered by land, a temporary BLF is proposed predominantly for the delivery of bulk construction materials, such as aggregate. Other types of material may also be imported through the temporary BLF, such as marine tunnel segments for marine works.	
Change 3: Greater flexibility as to where certain Sizewell B facilities are relocated to potentially avoid the need for car parking on Pillbox Field	As part of SZC Co.'s commitment to continue to engage with stakeholders and explore the possibility for re-using previously developed land within the existing Sizewell power station complex, an area of land within the Sizewell A complex has become potentially available for use by the Sizewell B relocated facilities project, subject to the completion of a land agreement. In addition, following further design development, the layout of the relocated facilities has been revised to facilitate easier and more efficient construction.	The WFD implications of these proposed changes were subject to a separate assessment presented in **Volume II**, **Appendix 14.2** of the **Sizewell B Relocated Facilities Environmental Statement** (Doc Ref. 6.1) [APP-164]. This assessment concludes that the proposed design changes would not impact upon the hydromorphology, physico-chemistry or biology of the Leiston Beck river water body (GB105035046271) or the quantity and quality of the Waveney & East Suffolk Chalk and Crag groundwater body (GB40501G400600). This change will not, therefore, be considered further in this assessment.
Change 4: Change to certain parameter heights and activities on the main development site	The quantity of materials that need to be managed on-site has increased by approximately two million tonnes. To accommodate this additional material an additional stockpile area would be required up to approximately 15m above ground level (35mAOD). The Application already applies for construction activities up to this height in the location and this change therefore relates to an additional activity, to also allow for stockpiling.	The potential impacts of materials stockpiling and construction activities within and outside the cut off wall were considered in **Section 2.5(h)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621],which concluded that the measures set out in the **Code of Construction Practice** (Doc Ref 8.11) [APP-615] would prevent impacts on the hydromorphology, physico-chemistry and biology of the Leiston Beck (GB105035046271) and Minsmere Old River (GB105035046270) water bodies and the chemistry of the

Design change	Outline description	WFD implications
	The proposed design of the temporary HCDF has changed and released approximately 50m of additional usable space that allows marine tunnelling works to take place outside of the cut off wall. Relocation of the marine tunnelling works means that other construction works within the cut off wall can commence before the marine tunnelling work is complete, thereby making construction more efficient and potentially faster. Since the submission of the Application, there has been further contractor involvement which has identified further detail on the approximate routes of access and haul roads. SZC Co. intends to construct a bat barn to compensate for potential disturbance for bats. The new structure would be approximately 6m above ground level (8m AOD). SZC Co. intend to improve connectivity between the two sites by providing a new mammal culvert located in close proximity to the existing culvert at Lover's Lane north of Leiston Recycling Centre. It would be designed with features to encourage use by mammals including otters and water voles. Otter fencing would also be installed to guide animals to the culvert. SZC Co. intend to reduce the height of the southernmost pylon from 79m AOD to 59mAOD ..	Waveney & East Suffolk Chalk and Crag groundwater body (GB40501G400600). The proposed changes to the height and footprint of individual stockpiles within the temporary construction area, changes to the timing and configuration of activities within the construction area, changes to the road layout, the addition of a new bat barn and the reduction in the height of one of the pylons would not alter the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] and are not assessed further.
Change 5: Change to the location of the	Further design work has identified that the water storage area can now be temporarily located elsewhere on the construction site, adjacent to a	**Section 2.1(d)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] considered the potential impacts of the proposed water resource storage area, wet woodland

Design change	Outline description	WFD implications
water resource storage area and the addition of flood mitigation measures to lower flood risk	proposed attenuation pond, also known as water management zone 5, and adjacent to the proposed borrow pits and stockpiles. The storage area's original proposed location would instead provide additional, permanent, fluvial flood mitigation. Wetland habitat would also be created in this area, comprising open water channels and wet reedbeds to provide high quality foraging habitats for marsh harriers and other species during the construction of Sizewell C. Once the construction of Sizewell C is complete and compensatory marsh harrier foraging habitats are no longer required, the open water and wet reedbed habitats could be transitioned to wet woodland habitats, either through natural successional processes or through planting. In the long term, if progressed, this would compensate for the loss of wet woodland from the Sizewell Marshes SSSI. The flood mitigation area would also be linked to the proposed permanent wetland habitat corridor immediately to the south to create a single integrated wetland feature.	habitat and flood compensation land, and concluded that there would be no effects on surface or groundwaters during construction or operation. The proposed changes to the location of the temporary water resource storage area and the provision of permanent fluvial flood mitigation at the original location would not change the level of impact on Leiston Beck (GB105035046271) or the Waveney & East Suffolk Chalk and Crag groundwater body (GB40501G400600). The conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] will therefore not be altered, and the impacts of this design change are not assessed further.
Change 6: Change to the Site of Special Scientific Interest (SSSI) crossing design to a single span bridge with embankments	The design of the SSSI crossing is proposed to be changed, to comprise separate embankments at either end with an approximately 30m long single-span bridge connecting them. A sheet pile barrier wall would be driven into the ground either side of the Leiston Drain, with the total distance between the walls being approximately 24m. The bank and channel of Leiston Drain would be unaffected.	The construction and operation of a new bridge across the Leiston Beck could result in impacts that are substantially different from those of the culvert that was proposed as part of the DCO submission and assessed in **Sections 2.5(i)** and **2.5(n)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621].

Design change	Outline description	WFD implications
	This new bridge design would retain substantially more space around the Leiston Drain. The revised design retains an approximate crest width of 40m at road level and an overall width of up to approximately 70m at its base. Splayed wing walls over the Leiston Drain would maximise daylight and reduce the amount of permanent SSSI land take of wet woodland habitat stated in the Application by approximately 0.02ha. During construction, the SSSI crossing would continue to include segregated lanes for pedestrians, two-way light goods vehicles and two-way working for off-highway dump trucks. Two "Bailey" style temporary crossings would be installed in advance of the main culvert crossing and within the SSSI crossing working area to provide an early route between the temporary construction area and the main construction area and to facilitate construction of the permanent bridge.	This change could potentially alter the conclusions of the previous assessment and will therefore be assessed in more detail in **Section 2.4**.
Change 7: Revisions to tree retention on the main development site	Three locations where changes are proposed to the DCO Landscape Retention and Site Clearance Plans have been identified. These changes have arisen from the conflicts between retained landscape and access required into various parts of the site as detailed design has progressed in preparation for implementation.	There are no mechanisms for the proposed changes to the tree retention plans to affect the quality elements of surface or groundwater bodies. This change are not therefore assessed further.
Change 8: Surface water removed early in the construction	In the period before the CDO is constructed, surface water would be temporarily pumped from the construction site, over the temporary sea defences and into a chamber before discharging water through	This new activity was not directly assessed in the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]. Any discharges to the Suffolk coastal water body (GB650503520002) would consist of clean surface run-off that

Design change	Outline description	WFD implications
process to be discharged to the foreshore via a temporary outfall	a gravity pipe towards the shoreline. The pipe size is assumed to be less than 50cm in diameter. A maximum total suspended solids content of 250mg/l is assumed. The outfall would be designed to be pumped at a maximum permitted rate of 200 litres per second. It is assumed that the outfall would provide flexibility and would typically only be used when surface water is captured in the construction site which cannot be discharged through infiltration or to the surrounding watercourses (e.g. due to flooding). Surface water under normal conditions would be collected in balancing ponds, treated via water treatment systems and then either infiltrated to ground or discharged to the surrounding watercourses at greenfield rates. The temporary outfall would be laid under the Suffolk Coast Path to ensure no obstruction and would then terminate above the Mean High Water Spring tide level. The temporary outfall is assumed to be located south of both the permanent and temporary beach landing facilities.	has been treated in the construction site drainage system, would only occur for a limited period during storm events, and would consist of a small volume of water relative to the volume of the receiving coastal water body. These temporary discharges are not, therefore, expected to impact upon the hydromorphology, physico-chemistry or biology of the coastal water body, and are not assessed further.
Change 9: Change to the sea defence to make the scheme more efficient and resilient to climate change	The temporary HCDF during the construction phase would comprise a sheet pile wall with a crest height of +7.3m AOD around the eastern perimeter of the main construction area. Under the proposed design, the crest height of the permanent sea defence (including the Northern Mound) would increase to +12.6m AOD plus up to two metres of landscaping. The seaward toe of the sea	Impacts resulting from the sea defence were considered in **Section 2.5(p)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]. This concluded that the activity would not result in deterioration in the hydromorphology of the Suffolk coastal water body (GB650503520002), when compared against current baseline conditions and the likely future baseline, when the defence could interact more directly with coastal waters.

Design change	Outline description	WFD implications
	defence would be buried to a depth of approximately +0mOD. The maximum crest height of the adaptive sea defence would be +16.4m AOD and landscaping would increase this to up to +18m AOD.	The HCDF would be considered to be a terrestrial feature during the construction phase and would not affect coastal processes. The 5m bund would be managed carefully due to the seaward extension of the toe of the coastal defence. During the operational phase, mitigation in the form of beach maintenance would be required. This is already proposed in **Chapter 20 Coastal Geomorphology and Hydrodynamics** of the **Environmental Statement** (Doc Ref. 6.3) [APP-311] but is likely to start sooner due to the revised toe design extending more seaward. If exposed, the HCDF would block alongshore sediment transport, accumulating shingle on its north side. A further seaward toe could become exposed sooner than presently predicted and therefore trigger beach maintenance sooner. The proposed changes to the sea defences would not, therefore, alter the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] and are not assessed further.
Change 10: Extension of landscaped bund, other minor changes at the southern park and ride, including a minor reduction of the Order Limits	The landscape bund along the north-west boundary of the site could be extended to further aid visual and acoustic screening from the adjacent landscape and habitat. Additionally, minor design changes are proposed to reduce the Order Limits to the south of the A12, and to retain an existing private access along the eastern boundaries of the site.	The potential impacts of the southern park and ride were considered in **Section 3.5** of **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622],which concluded that there would be no impacts on the River Ore (GB105035045970), River Deben (GB105035046310) or Waveney & East Suffolk Chalk and Crag groundwater body (GB40501G400600). The proposed changes would not alter the way in which the southern park and ride would interact with surface or groundwater or change the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] and are not assessed further.

Design change	Outline description	WFD implications
Change 11: Extension of the Order Limits to provide for additional fen meadow habitat at Pakenham as mitigation for fen meadow loss	The Application identifies two sites for fen meadow mitigation habitat at Benhall and Halesworth. Further advice from Natural England recommends that a larger extent of land is required in order to ensure sufficient mitigation habitat. A third site at Pakenham as therefore been identified to further increase the probability of creating sufficient fen meadow habitat to mitigate for the loss of fen meadow from the Sizewell Marshes SSSI. SZC Co. has identified an additional site at Pakenham in West Suffolk, which has the potential for creating fen meadow. The site proposed comprises approximately 32ha of land located to the west of Fen Road, south of Thieves Lane / Broadway, east of Thurston Road and to the north of the Street. The site currently comprises a mix of grassland, fen meadow, rush pasture and drier grassland and is adjacent to the designated Pakenham Meadows SSSI for which lowland wet grassland and fen meadow are the primary interest features. The site has been identified as being potentially suitable for the creation of fen meadow as it lies in a shallow basin bisected by the Pakenham Stream, and is in close proximity to other areas of fen meadow habitat. Within the site identified, a total of 4.9ha is considered the primary locus for the creation of new fen meadow habitat, and some of the wider areas on the site may also have the potential for the creation of new fen meadow habitat.	**Section 2.1(d)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] considered the potential impacts of the proposed fen meadow compensation areas, and concluded that there would be no effects on surface or groundwaters during construction or operation. The proposed new habitat creation site at Pakenham is likely to result in the same minimal level of impact on associated surface and groundwater bodies as those assessed at DCO stage. However, because the new site would be located in a different water body catchment and the site-specific impacts of the proposals were not directly considered, the implications of this change are assessed in **Section 2.5**.

Design change	Outline description	WFD implications
Change 12: Extensions and reductions of the Order Limits for works on the two village bypass, Sizewell link road and Yoxford roundabout	A minor change to the Order Limits is proposed to maximise visibility of the existing access road which will join the two village bypass at the north-west staggered junction, east of the River Alde bridge crossing.There is also an opportunity to use land within the Order Limits to provide additional habitat to mitigate for the loss of the floodplain grazing marsh habitat. Additional land may be necessary to provide increased visibility at junctions proposed along the Sizewell link road. This may involve further works and vegetation removal to improve highway safety. The approach to drainage has also changed, and it is now proposed to hold water in attenuation basins and manage the release of the water to local watercourses, in accordance with the hierarchy within the **Outline Drainage Strategy** located in **Volume 2**, **Chapter 2**, **Appendix 2A** of the **Environmental Statement** (Doc Ref. 6.3) [APP-181]. This has resulted in the need for additional areas of land within the Order Limits to accommodate additional basins and potential routes to discharge surface water flows to local watercourses. Other minor design changes are proposed which would extend or reduce the Order Limits or the length of time the land is needed for, including– an additional walking and cycling route. There is one minor reductions proposed to the Order Limits for the Yoxford roundabout to account for mapping or boundary discrepancies.	The potential impacts of the two village bypass were considered in **Section 3.6** of **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622]. This concluded that following mitigation, the construction of watercourse crossings and the permanent presence of the bridge and culverts would not result in deterioration in the hydromorphology and biology of the River Alde or connected water bodies. The proposed changes to maximise the visibility of the existing access road and formalise the public right of way would not alter the way in which the proposals would interact with water receptors or change the conclusions of the DCO WFD compliance assessment and is not assessed further. The changes associated with the improvement of floodplain grazing marsh will provide a linkage between the River Alde and its floodplain and increase the complexity of the surface drainage network. These changes will not, therefore, result in deterioration in water body status, and could potentially contribute towards an improvement in hydromorphology (hydrological regime and lateral continuity) and biology (by improving habitats for invertebrates and macrophytes). The potential impacts of the Sizewell link road were considered in **Section 3.7** of **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622]. This concluded that following mitigation, the construction and operation of watercourse crossings would not result in deterioration in the status of the Minsmere Old River (GB105035046270) or connected water bodies. A detailed ground investigation has demonstrated that infiltration rates are very low, and that additional attenuation basins will be required to manage surface water runoff and manage the release of water to local watercourses. These additional basins are consistent with the overall drainage

Design change	Outline description	WFD implications
		strategy, and will minimise effects to surface water receptors from increased runoff and groundwater from any reduction in infiltration associated with the development. The proposed changes would, therefore, ensure that there is no deterioration in the status of the Minsmere Old River or connected groundwaters. The conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] will, therefore, not be altered, and the impacts of this design change are not assessed further. The potential impacts of the Yoxford roundabout were considered in **Section 3.8** of **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622], which concluded that there would be no impacts on the Minsmere Old River (GB105035046270) or Waveney & East Suffolk Chalk and Crag groundwater body (GB40501G400600). The proposed changes would not alter the way in which the highways works would interact with surface or groundwater or change the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] and are not assessed further.
Change 13: Minor extensions and reductions of the Order Limits for works on the main development site and related sites (fen meadow mitigation and marsh harrier improvement sites)	There are a number of minor reductions and additions proposed to the Order Limits for the main development site and the off-site habitat creation sites. These relate to the fen meadow compensation sites to the south of Benhall and to the east of Halesworth, the marsh harrier habitat improvement area to the west of Westleton, the temporary construction area, and Sizewell B relocated facilities and National Grid land.	**Section 2.1(d)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] considered the potential impacts of the proposed fen meadow compensation areas, and concluded that there would be no effects on surface or groundwaters during construction or operation. The proposed changes to the Order Limits would not change the way in which the proposals would interact with surface or groundwater or change the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] and are not assessed further.

Design change	Outline description	WFD implications
Change 14: Minor reductions to the Order Limits of the northern park and ride, the A12/B1119 junction at Saxmundham and the A1094/B1069 south of Knodishall	There are two minor reductions proposed to the Order Limit boundary of the northern park and ride to account for mapping or boundary discrepancies. There are minor reductions proposed to the Order Limits for the A12/B1119 junction at Saxmundham and the A1094/B1069 south of Knodishall to account for mapping or boundary discrepancies.	The potential impacts of the northern park and ride were considered in **Section 3.4** of **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622],which concluded that there would be no impacts on the Minsmere Old River (GB105035046270) or Waveney & East Suffolk Chalk and Crag groundwater body (GB40501G400600). The proposed changes would not alter the way in which the northern park and ride would interact with surface or groundwater or change the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] and are not assessed further. The potential impacts of the changes to the A12/B1119 junction and the A1094/B1069 junction were considered in **Section 3.8** of **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622], which concluded that there would be no impacts on the Minsmere Old River (GB105035046270) or Waveney & East Suffolk Chalk and Crag groundwater body (GB40501G400600). The proposed changes would not alter the way in which the highways improvements would interact with surface or groundwater or change the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] and are not assessed further.
Change 15: A new bridleway link between Aldhurst Farm and Kenton Hills	A crossing point would be provided over Lover's Lane from the northern field of Aldhurst Farm into the arable field to the north. A new route would then pass through an existing field, parallel to the field boundary, towards Kenton Hills. It would then join the existing Bridleway 19 route. The new permanent route and crossing point would be made available for pedestrians in the construction phase once the entrance to the main development	There are no mechanisms for the proposed new bridleway to affect the quality elements of surface or groundwater bodies. This change is not therefore assessed further.

Design change	Outline description	WFD implications
	site from the B1122 is in place and the number of HGVs using the early years access is reduced. The link would be designated as a bridleway once construction is complete.	

2.2.2 **Table 2.1** demonstrates that the majority of the proposed design changes would not result in additional impacts that would affect water body status or change the conclusions of **Parts 2**, **3** or **4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623]. However, further assessment is required to assess the WFD compliance implications of the following design changes:

- enhanced permanent beach landing facility and options for a new, temporary facility to import material by sea;
- change to the Site of Special Scientific Interest (SSSI) crossing design to a single span bridge with embankments; and
- extension of the Order Limits to provide for additional fen meadow habitat at Pakenham as mitigation for fen meadow loss.

2.2.3 These will be assessed in **Sections 2.3 - 2.5**, respectively.

2.3 Beach landing facility

a) Changes to proposed design

2.3.1 Since submission of the Application, it has been identified that there may be the potential for more material to be brought to the site by sea than is currently provided for in the Application. As described in this section, this would be achieved by:

- enhancing the design of the permanent BLF; and
- providing a new temporary BLF.

i. Enhancing the design of the permanent BLF

2.3.2 To increase the amount of Abnormal Indivisible Loads (AILs) that could be delivered by sea, it would be necessary to make the seabed in front of the permanent BLF better able to receive more regular deliveries by barge without requiring additional maintenance works.

2.3.3 The proposal is to add submerged beams that span parallel to the beach, thereby creating a solid base on top of the seabed. This grillage represents construction of an additional structure for the permanent BLF in the marine environment. The sequence of installation is assumed to comprise:

- Prepare grounding area (approximately 100m x 30m) by trimming the seabed dredge plough.

- Place ground beams in trenches using a crane. Approximately 25 small bore piles would be required to control lateral shift of the grillage.
- Place platform or cross beams on top of ground beams using a crane and secure to ground beams.

2.3.4 The permanent BLF would be longer to better align the barge deck with the platform, making deliveries safer and more efficient. It would require approximately 28 permanent piles in total. The approximate dimensions of the piles are as follows:

- 24 of these piles are expected to have a diameter of approximately one metre.
- Four fender piles are expected to have a diameter of approximately 2.5 metres.

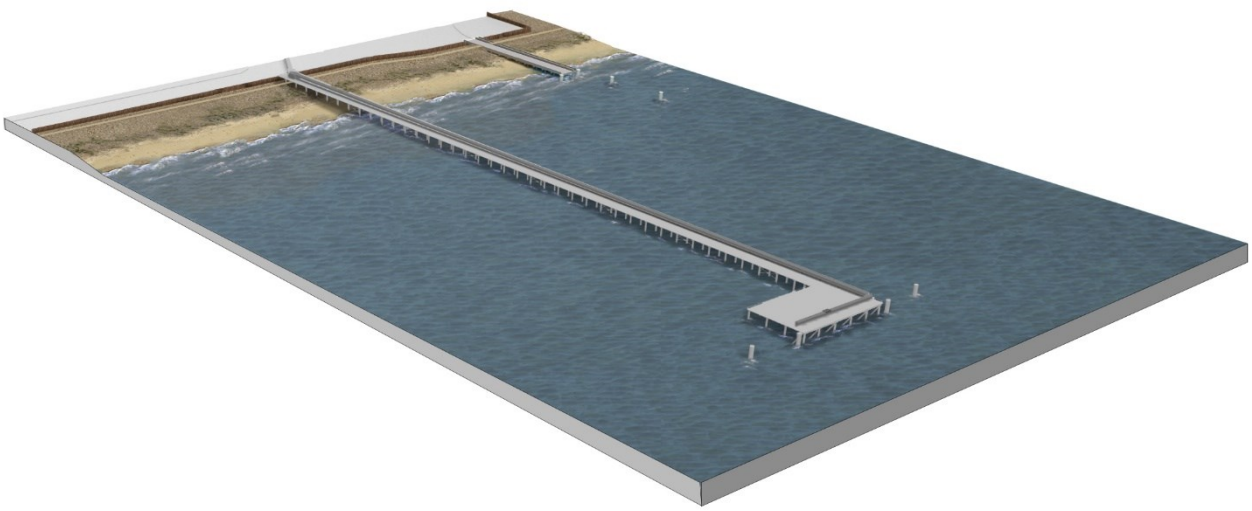
ii. Providing a new temporary BLF

2.3.5 To reduce the amount of construction material that would otherwise need to be delivered by road, an additional (temporary) BLF is also proposed and would be used for the delivery of bulk materials such as aggregate and backfill soils.

2.3.6 The temporary BLF would potentially be in place up to 2030 to be available to help manage the peak requirement for aggregates and other bulk materials. It would be located to the south of the enhanced permanent BLF.

2.3.7 The temporary BLF would be up to approximately 505m in length and up to approximately 12m in width for the main jetty. An enlarged unloading area would form a jetty head with dimensions of up to approximately 62m in width. A single berth (for a single vessel) is assumed at its seaward end. The structure would be a visually recessive colour as far as reasonably practicable.

Plate 2.1: Proposed temporary BLF



Design

2.3.8 A temporary conveyor would be installed along the length of the temporary BLF deck and would be the primary method of unloading material. The conveyor would follow the deck to the Hard Coastal Defence Feature (HCDF) where it would continue into the secure construction area. Except where necessary for loading, unloading or maintenance, the conveyor would be covered.

Construction

2.3.9 With the exception of the mooring dolphins, which would be installed using a jack-up barge, the temporary BLF would be predominantly constructed without placing construction vehicles into the sea. A crane, cantilever frame and piling equipment (including generators) are assumed to be located on the temporary BLF during construction. The temporary BLF would be constructed sequentially from the shore using a cantilever (Cantitravel) technique. A crane would not be used as part of normal operations.

2.3.10 The duration of the construction period for the temporary BLF is expected to be up to approximately nine months. The installation and commissioning of the conveyor system is assumed to take approximately a further eight months. It is assumed that the temporary BLF would be constructed at the same time as the permanent BLF.

2.3.11 The temporary BLF would predominantly be dismantled without placing construction vehicles into the sea, including use of a crane on the BLF. Piles would typically be removed by pulling using a vibrohammer. Piles that cannot be removed using this method would require the use of a jack-up barge and would be cut off below sea bed level and removed.

Operation

2.3.12 The temporary facility has the potential to operate at night as well as during the day, unlike the enhanced permanent BLF. Standard navigation lights would be required on mooring dolphins and on nearby navigation markers and buoys. Task and ambient lighting would be required along the temporary BLF and would be installed, operated and maintained in general accordance with the controls and limits set out in section 1.3 of the Lighting Management Plan (Doc Ref. 6.3) [APP-182].

2.3.13 A dredging volume of approximately 9,250m^3 is assumed to facilitate access and barge grounding at the enhanced permanent BLF. This increased requirement is due to the assumption that the dredging area would extend deeper into the longshore bar than in the DCO submission. The same type of flat-top barges would be used for the enhanced permanent BLF which require tugs to tow them. Barges have a high carrying capacity and a shallow draught, meaning they can float close to shore with heavy loads and without requiring extensive dredging. Self-propelled vessels would be used to deliver aggregates to the temporary BLF which, terminating in deeper water seaward of the nearshore bars, would not require dredging.

a) Potentially affected water bodies

2.3.14 As set out in **Sections 2.5(j)** and **2.5o)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621], the proposed BLFs would be wholly located within the Suffolk (GB650503520002) coastal water body.

2.3.15 The assessment presented in the subsequent sections is based on the latest water body classification data, which was published by the Environment Agency in September 2020 (Ref.3).

b) Potential impacts on water body status

i. Introduction

2.3.16 The quality elements identified in **Section 2.5(j)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] scoped into the assessment were:

- Water quality – chemical and physico-chemical.

- Biology – habitats.

2.3.17 However, a review of the scoping exercise confirms that hydromorphology should now be scoped in, given the possibility that the proposed changes have the potential to '*significantly impact the hydromorphology of a WFD water body*'. Consideration of the potential effects on hydromorphology are, therefore, carried through to further assessment.

2.3.18 The same control measures identified in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] are still applicable and include limiting the dredge footprint as far as is practicably achievable for all marine structures, including the proposed changes to the BLFs outlined above. Maintenance dredging would be minimised and monitored to ensure the programme is reduced as far as possible and carried out under conditions that limit the disruption of longshore transport as far as possible.

ii. Hydromorphology

2.3.19 The enhanced permanent BLF and temporary BLF would include open piled structures which would be transmissive and, therefore, result in similar patterns of altered bed shear stress (small increases and decreases) to that reported in **Chapter 20 Coastal Geomorphology and Hydrodynamics** of the **ES** (Doc Ref. 6.3) [APP-311] for the permanent BLF. As the new temporary BLF is likely to be around 165m to the south of the permanent BLF, this would be of sufficient distance that a cumulative effect would be unlikely to occur when the enhanced permanent BLF and temporary BLF are not in use.

2.3.20 However, the grillage that would be used for the enhanced design would stand proud of the bed by less than 1m and would initially slow sand transport until sufficient sediment had accumulated along its sides. Sand generally travels in suspension (especially during storms) and, therefore, eventually would likely move over the grillage. On occasion, light injection dredging may be required if sand accumulates on the grillage when the BLF is in use. However, local impacts on the elevation of both longshore bars would lead to minor changes locally, although these would not be experienced on a water body scale.

2.3.21 Because the temporary BLF extends into deeper water beyond the longshore bars, the head would be more transmissive and piles located offshore are unlikely to exhibit detectable impacts at the shoreline.

2.3.22 In terms of dredging, the most significant effect of the enhanced permanent BLF was expected to be its effect on bed shear stress (the pressure the moving water exerts on the sediment, leading to sediment movement) from the reprofiled bed for the barge grounding pocket and navigation access when in use. As the enhanced permanent BLF would be longer, a further

15m of the outer longshore bar would need to be dredged to accommodate the grounding. The barge turning-circle would also require dredging of any areas of overlap with the outer longshore bar where it exceeds -3.5mODN.

2.3.23 With no dredging requirement, the spatial footprint of increased bed shear stress from the temporary BLF would be almost the same regardless of whether the structure is in use and not in use.

2.3.24 Whilst there are likely to be localised changes, these are predicted to be relatively small scale and unlikely to cause a non-temporary effect on the WFD water body.

iii. Physico-chemistry

2.3.25 The conclusions regarding the potential effects of piling in the marine environment on water quality are not significantly changed from those assessed in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621], in that effects would be localised and short term and would occur concurrently given the proposal to construct the two BLFs at the same time.

2.3.26 The volume of sediment released during dredging to prepare the areas for construction would increase as a result of the enhancement to the permanent BLF, due to the barge turning circle. However, whilst a small increase in dredge plume extent would be expected, this is likely to be small scale in relation to the WFD water body and within the natural variability experienced in this coastal water body. Additionally, baseline conditions would return following cessation of the works.

iv. Biology

Habitats

2.3.27 Given the similarity in sediment type in the two areas impacted by the changes, similar habitats and species are likely to be present. **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] indicated that approximately 0.01% of a lower sensitivity habitat would be disturbed by the dredging activities. This is unlikely to be altered to an extent that a non-temporary effect on the communities would be experienced, given that the effect is disturbance rather than direct loss. As a result, the combined effect of the proposed changes is unlikely to be sufficient to result in a change in WFD water body status.

Phytoplankton

2.3.28 As outlined in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621], phytoplankton exposed to increases in sediment may be

susceptible to reductions in productivity. However, the short duration and transitory nature of any plume (even if increased as a result of the proposed changes) would not result in an effect in WFD water body status.

v. Chemistry

2.3.29 The concentrations of priority substances and priority hazardous substances within the sediments to be impacted are detailed in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]. Given the location of the temporary BLF approximately 165m south of the permanent BLF, it is anticipated that similar conditions would be present.

2.3.30 The sandy nature of the material (which therefore settles quickly) and short term nature of sediment disturbance events reduces the risk to water quality parameters and therefore the conclusions in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] are not altered by the proposed changes, even with possible increases in plume concentrations and extent. Effects are, therefore, predicted to be insufficient to the result in change in WFD water body status.

vi. Connected water bodies

2.3.31 Even with the increased dredge areas, it is unlikely that the plume would extend as far as the transitional water bodies, given the distances from the activity to these water bodies. There could, however, potentially be increases in sediment concentrations in the vicinity of the Minsmere Sluice but again, the relatively transitory and short term nature of the plume reduces the potential for the plume to coincide with the opening of the sluice. As a result, the conclusions reached in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] are not altered by the proposed changes.

c) Potential impacts on RBMP mitigation measures

2.3.32 The mitigation measures identified in the River Basin Management Plan (RBMP) have all been classified as “not applicable” by the Environment Agency (Ref.3), and as such have not been considered further in this assessment. Furthermore, potential impacts on RBMP mitigation measures were scoped out in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]. Given that the previous sections demonstrate that the conclusions of this assessment would not be altered as a result of the design changes.

d) Potential impacts on Protected Areas

2.3.33 Potential impacts on Protected Areas were scoped out in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]. Given that the

previous sections demonstrate that the conclusions of this assessment would not be altered as a result of the design changes.

e) Summary of impacts

2.3.34 Whilst there may be increased piling and dredging requirements which could potentially give rise to increased sediment concentrations over and above those outlined in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621], the plume would be transitory, short term in nature and likely to be within the natural variation experienced in the WFD water body. Consequently, effects on water quality parameters and biology are likely to be temporary (i.e. they would not result in any non-temporary impacts or result in deterioration in water body status under the WFD).

2.3.35 The temporary BLF would result in relatively small changes to the hydromorphology of the water body, which are unlikely to result in impacts at the water body scale. Additionally, the temporary BLF would be removed following completion of the construction phase thus reducing the effects to those purely associated with the enhanced permanent BLF.

2.4 SSSI crossing

a) Changes to proposed design

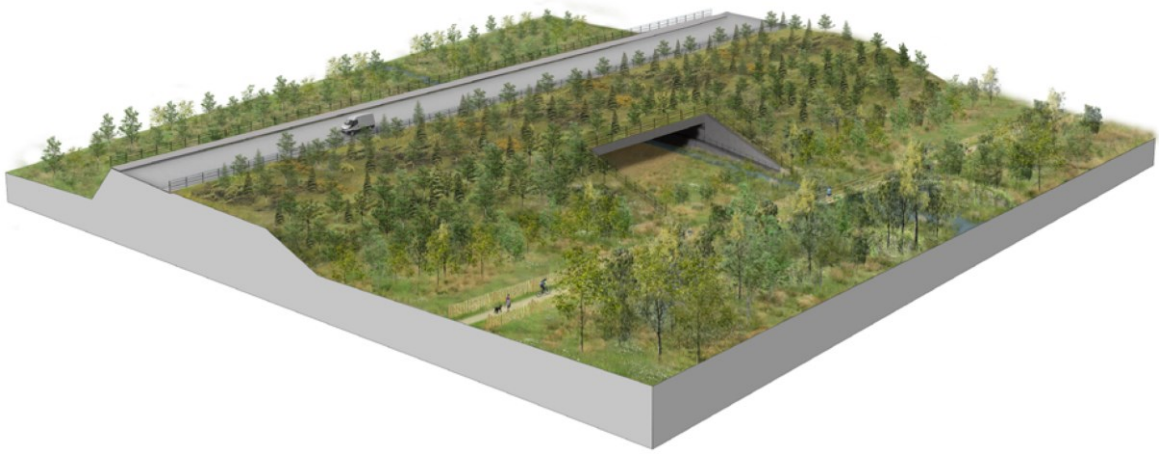
2.4.1 The main development site would be accessed from the north, via a new access road linking the site to the B1122. The Application includes a vehicular and pedestrian crossing over the Sizewell Marshes Site of Special Scientific Interest (SSSI).

2.4.2 SZC Co. proposes to change the design from an embankment and culvert to comprise separate embankments at either end of the SSSI crossing with a 30m long single-span bridge connecting them (**Plate 2**Error! Reference source not found.). A sheet pile barrier wall would be driven into the ground either side of the Leiston Drain, with the total distance between the walls being approximately 24m. The bank and channel of Leiston Drain would be unaffected. The bridge abutments would be offset from Leiston Beck by approximately 1.2m on the north bank and approximately 21m on the south bank. The bridge deck would have a width of 40m, and the base of the embankment would have an overall width of approximately 70m. The deck would be set at a height of 4.75m above the floodplain.

2.4.3 The bridge design would retain significantly more space around the Leiston Beck and would reduce the amount of permanent SSSI land take by approximately 0.02ha. The change provides additional flood relief by reducing the amount of floodplain loss (to 5700m^2 within the footprint of the bridge abutments and embankment during the 1:100 year flood), which

would reduce water levels during times of increased flood risk compared with the current design.

Plate 2.2: Revised SSSI crossing



b) Potentially affected water bodies

2.4.4 As set out in **Section 2.5(n)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621], the proposed SSSI crossing would be wholly located within the Leiston Beck (GB105035046271) river water body catchment. Leiston Beck drains into the Minsmere Old River (GB105035046270) approximately 1.9km downstream of the proposed crossing. The site is underlain by the Waveney & East Suffolk Chalk and Crag groundwater body (GB40501G400600).

2.4.5 The assessment presented in the subsequent sections is based on the latest water body classification data, which was published by the Environment Agency in September 2020 (Ref.3).

c) Potential impacts on water body status

i. Construction impacts

2.4.6 As described in **Section 2.4a)**, the revised crossing of Leiston Beck would consist of a bridge that does not directly interact with the bed and banks of the watercourse or associated in-channel and riparian habitats. Furthermore, there would be considerable space for natural channel adjustments to occur in the future (noting that rates of channel change in the low energy Leiston Beck system are expected to be low, see **Chapter 19 Groundwater and Surface Water** of the **ES** (Doc Ref. 6.3) [APP-297]). This means that there is no mechanism for construction of the bridge to directly affect the hydromorphology and biology of the water body.

2.4.7 Construction would require ground disturbance, excavation and soil exposure, which could potentially result in an increase in the supply of fine sediment to the Leiston Beck water body. Furthermore, construction could also present a risk to the water body with respect to accidental spills of concrete, fuels and lubricants from construction machinery working in close proximity to the watercourse. However, the best practice measures to prevent the supply of contaminants and fine sediment during construction set out in the **Code of Construction Practice** (Doc Ref. 8.11) [APP-615] would prevent the input of fine sediment and contaminants into the watercourse, and prevent any changes to physico-chemistry and hydromorphology.

2.4.8 The potential effects of bridge construction are not predicted to be sufficient to result in deterioration in the status of any hydromorphological or physico-chemical quality elements of Leiston Beck or the biological quality elements that they support.

2.4.9 Given the above, impacts on Leiston Beck and the fact that the activities would be located 1.9km upstream, there are not predicted to be any impacts on the downstream Minsmere Old River water body. Furthermore, the proposed design changes are not expected to result in significant changes in the interaction between surface waters and the underlying groundwater that are examined in detail in **Section 2.5i)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621], and will, therefore, not result in deterioration in the status of the Waveney and East Suffolk Chalk and Crag groundwater body.

ii. Operational impacts

Hydromorphology

2.4.10 The proposed combination of embankments separated by a bridge would have no direct interaction with Leiston Beck itself while flows are confined to within the banks, with the watercourse crossing being designed to preserve the natural integrity of the river bed, banks and riparian zone. There will, therefore, be no direct effects on morphological conditions, in-bank flow regime and sediment transport regime of Leiston Beck.

2.4.11 The permanent presence of the embankment across the floodplain of watercourse could, however, act as a barrier to the free movement of water across the floodplain during periods of out of bank flow, even though they would be set back from the channel. Existing natural flow paths could potentially be disrupted, with water movement restricted to within the bridge aperture rather than the wider floodplain. The concentration of flood water within the aperture could result in increased scour in the channel of the Leiston Beck.

2.4.12 However, fluvial flows up to the 1:100 year event plus an allowance for climate change do not exceed the level of the sheet piling, and although there is a slight narrowing of the floodplain due to the presence of the embankments (and a loss of 5700m^2 floodplain during the 1:100 year flood; this is smaller than would have occurred as a result of the culvert design due to the wider bridge aperture), slow flow velocities means that there are limited effects on out of bank flows (Doc Ref. 5.2(A)Ad). The large size of the span (c.24m), therefore, means that there would not be a significant change in flow velocities and hence there would be minimal risk of increased scour or any other geomorphological adjustments occurring in Leiston Beck (Doc Ref. 5.2(A)Ad).

Physico-chemistry

2.4.13 Sustainable drainage infrastructure (proposed as swales and infiltration basins) would be installed along the length of the embankments, minimising surface water run-off and preventing diffuse pollution from sediment and other pollutants arising. Bypass separators and silt traps would be incorporated within the drainage design where necessary. The swales would attenuate and convey surface water run-off at a rate not exceeding existing green field run-off rates.

Biology

2.4.14 As stated above, the design of the watercourse crossing, with bridge abutments offset from the river channel, would preserve the integrity of the river bed, banks and riparian zone, thereby avoiding direct impact on habitats for fish, invertebrates and macrophytes.

2.4.15 Although the bridge deck could potentially alter light conditions, the size of the aperture means that light would still be able to penetrate beneath some the structure and that any changes in light levels would be gradual rather than abrupt. However, the structure would be 6-8m in height and approximately 45m in width so it is likely that the area underneath the centre of the bridge is assumed to be in deep shade.

2.4.16 This would affect vegetation composition within the shadow of the bridge to more shade tolerant species underneath the margins of the bridge to a potential absence of vegetation in the middle (Doc Ref. 8.11(A)A). Lower light levels and a change in vegetation composition would reduce the diversity of aquatic invertebrate species that live within the shadow of the bridge, however aquatic invertebrates would still be able to drift through the watercourse, actively or passively, and travel along the bank, using remaining bankside vegetation, where present. Where no vegetation is present, a rough textured surface such as hessian sacking would be added to the bank to provide a rough substrate for invertebrates within the watercourse to travel through or out (Doc Ref. 8.11(A)A).

2.4.17 The bridge is, therefore, unlikely to cause fragmentation of invertebrate populations either side of the structure. Furthermore, the increase in shading will affect a maximum of 69m, which represents 1.59% of the 4334m-long water body and is, therefore, unlikely to result in status deterioration for macrophytes or the aquatic invertebrate assemblages associated with Sizewell Marshes SSSI or the Minsmere European site.

2.4.18 The bridge is unlikely to be a substantial barrier to winged adult stages of aquatic invertebrate species, particularly the Norfolk hawker (*Anaciaeschna isoceles*) dragonfly, a species protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) (Ref.4), which has been recorded in Sizewell Marshes and Minsmere European site. Whilst deep shade would occur underneath the centre of the structure, the size would be sufficient enough to allow invertebrates navigating along Leiston Beck to fly under the bridge, albeit at a potentially reduced rate, or be pushed up and over the bridge and road (Doc Ref. 8.11(A)A). Norfolk hawker in particular is wide ranging, can disperse 10km on emergence from watercourses (Ref.5) and has spread from a small area in the Norfolk Broads in the 1970s to Suffolk and Cambridgeshire (Ref.6). This suggests that dispersal of this species is not limited by roads. A speed limit of 15mph, as detailed in the **Code of Construction Practice** (Doc Ref 8.11) [APP-615] to reduce air quality impacts, would minimise incidental mortality of winged individuals flying over the bridge through vehicle strike (Doc Ref. 8.11(A)A).

2.4.19 Aquatic invertebrates have been shown to be attracted to polarised light reflected off dark, shiny surfaces such as tarmac, particularly close to watercourses which can mimic the surface of water (Ref.7). The road surface of the SSSI crossing could attract winged adult aquatic invertebrates that then use the road for navigation (instead of a watercourse), foraging or oviposition all which may result in mortality of adults or eggs. The **Aquatic Invertebrate and Fish Mitigation Strategy** (Doc Ref. 8.11(A)A) recommends the use of a road surface that is light in colour with a rough texture on the SSSI bridge crossing plus at least 100m either side, such as a top layer of light coloured anti-skid surface coating. Light colours reflect less polarised light and rough textures diffuse light reflection reducing the attractiveness of such surface to aquatic invertebrates (Ref.7). If this is not suitable, it is advised to paint white lines across the road which would break up the tarmac surface and also reduce reflected polarised light (Doc Ref. 8.11(A)A).

2.4.20 The lack of obstruction of the watercourse would allow continued passage for fish species, including European eel (*Anguilla anguilla*) which has been recorded in Sizewell Marshes SSSI. The risk of deterioration in the status of the biological quality elements at a water body scale is, therefore, considered to be minimal.

Connected water bodies

2.4.21 Given the above, and the fact that the activities would be located 1.9km upstream, there are not predicted to be any impacts on the downstream Minsmere Old River water body.

2.4.22 In addition, the proposed design changes are not expected to result in significant changes in the interaction between surface waters and the underlying groundwater that are examined in detail in **Section 2.5n)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]. Therefore, this would not result in deterioration in the status of the Waveney and East Suffolk Chalk and Crag groundwater body.

d) Potential impacts on RBMP mitigation measures

2.4.23 The mitigation measures that are defined in the RBMP to ensure that the Leiston Beck water body achieves Good Ecological Potential are set out in **Table 2.2**. In this case, none of the measures have been fully implemented and are thus not considered to be 'in place'; they are instead proposed for future implementation (i.e. they are 'not in place').

2.4.24 This demonstrates that the revised design, which avoids direct interaction with the watercourse, would not counteract or prevent the future implementation of any of the mitigation measures identified for the Leiston Beck water body in the RBMP.

Table 2.2: Potential impacts on mitigation measures set out in the RBMP for Leiston Beck

RBMP mitigation measure	Potential impact
Remove obsolete structure	The proposed bridge would not introduce new in-channel structures or prevent the removal of obsolete structures from the bed and banks of Leiston Beck.
Remove or soften hard bank	The proposed bridge would not introduce new hard bank protection (with new structures offset from the river channel) or prevent the removal or softening of existing hard bank protection elsewhere in Leiston Beck.
Preserve or restore habitats	The proposed bridge abutments would be offset from the river channel, and will therefore not directly prevent the implementation of measures to preserve or restore habitats. An increase in shading beneath the bridge deck would be limited to a maximum of 1.59% of the water body and is therefore not considered sufficient to impact on the overall effectiveness of this measure (cf. **Section 2.4b)**). Furthermore, the bridge design would retain significantly more space around the Leiston Beck than the previous culvert option, reducing the amount of habitat take by approximately 450m^2 and ensuring that habitat continuity is retained along the river corridor.
In-channel morph diversity	The proposed bridge, with offset abutments and no direct interaction with the river channel, would not reduce in-channel morphological diversity or reduce the effectiveness of measures to improve morphological diversity elsewhere in Leiston Beck.
Re-opening culverts	The proposed bridge would no longer result in the introduction of a new culvert in the Leiston Beck water body. Furthermore, the bridge will not prevent the removal of existing culverts elsewhere in the water body.
Alter culvert channel bed	The proposed bridge would not prevent the alteration of the bed of existing culverts in the Leiston Beck water body.
Flood bunds	The proposed bridge abutments would be offset from the river channel in a 23.8m-wide river corridor, and although there is a slight narrowing of the floodplain (resulting in a loss of floodplain within the footprint of the structure, albeit smaller than under the previous culvert design as a result of the wider bridge aperture), this only has limited effects on out of bank flows (cf. **Section 2.4b)**). The bridge will therefore retain flows and will not prevent measures to address the impacts of existing flood bunds elsewhere in the catchment.
Set-back embankments	The proposed bridge abutments would be offset from the river channel, and would not prevent the removal or set-back of existing embankments in the Leiston Beck catchment.

RBMP mitigation measure	Potential impact
Floodplain connectivity	The bridge design would retain significantly more space around the Leiston Beck than the previous culvert option, minimising the loss of floodplain to resulting in a loss of 5700m^2 within the footprint of the structure. The large span of the bridge would also continue to allow out of bank flows to occur, and as such would not significantly reduce floodplain connectivity. Furthermore, the bridge would not prevent the delivery of improvements to floodplain connectivity in the wider Leiston Beck catchment.
Fish passes	The proposed bridge would not introduce new in-channel structures or prevent the installation of fish passes on existing structures in Leiston Beck.
Reduce fish entrainment	The proposed bridge would not prevent the implementation of measures to reduce fish entrainment from existing intakes in Leiston Beck.
Enhance ecology	The proposed bridge abutments would be offset from the river channel, and would therefore not directly prevent the implementation of measures to enhance ecology. An increase in shading beneath the bridge deck would be limited to a maximum of 1.59% of the water body and is therefore not considered sufficient to impact on the overall effectiveness of this measure (cf. **Section 2.4b)**). Furthermore, the bridge design would retain significantly more space around the Leiston Beck than the previous culvert option, reducing the amount of permanent SSSI land take by approximately 0.02ha and ensuring that habitat continuity is retained along the river corridor.
Changes to locks etc.	The proposed bridge would not prevent the implementation of measures to change the operation of existing structures in Leiston Beck.
Selective vegetation control	The proposed bridge would not prevent the implementation or reduce the effectiveness of selective vegetation control measures in Leiston Beck.
Vegetation control	The proposed bridge would not prevent the implementation or reduce the effectiveness of vegetation control measures in Leiston Beck.
Vegetation control timing	The proposed bridge would not prevent the implementation or reduce the effectiveness of phased vegetation control measures in Leiston Beck.
Invasive species techniques	The proposed bridge would not prevent the implementation or reduce the effectiveness of measures to control the spread of invasive species in Leiston Beck.

RBMP mitigation measure	Potential impact
Retain habitats	The proposed bridge would not prevent the implementation or reduce the effectiveness of measures to retain habitats during vegetation and sediment management in Leiston Beck.
Sediment management strategy	The proposed bridge would not alter the sediment regime of Leiston Beck or prevent the implementation of a sediment management strategy.
Maintain channel bed / margins	The proposed bridge would not prevent the implementation or reduce the effectiveness of measures to maintain the channel margins during vegetation and sediment management in Leiston Beck.
Woody debris	The proposed bridge would not prevent the implementation or reduce the effectiveness of measures to retain woody debris during vegetation and sediment management in Leiston Beck.
Water level management	As a clear span structure offset from the banks of the river, the proposed bridge would not prevent the implementation or reduce the effectiveness of measures to manage water levels in Leiston Beck and connected watercourses.
Align and attenuate flow	As a clear span structure offset from the banks of the river, the proposed bridge would not prevent the implementation or reduce the effectiveness of measures to align or attenuate flow in Leiston Beck.

e) Potential impacts on Protected Areas

2.4.25 The potential impacts of the proposed bridge crossing on Protected Areas located within the Leiston Beck catchment are considered in **Table 2.3**.

Table 2.3: Potential impacts on Protected Areas in Leiston Beck

Protected Area	Potential impact
Leiston Beck Nitrate Vulnerable Zone (NVZ) S661	The proposed change to the design of the SSSI crossing would not introduce a new source of nitrates into the Leiston Beck water body. There is, therefore, no mechanism for this change to affect NVZ S661.
Leiston Beck and Minsmere Old River NVZ S415	The proposed change to the design of the SSSI crossing would not introduce a new source of nitrates into the Leiston Beck water body. There is, therefore, no mechanism for this change to affect NVZ S415.
Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC)	The proposed change to the design of the SSSI crossing is located approximately 1.75km to the south of the SAC. Any impacts associated with the new bridge would be highly localised (cf. **Section 2.4b)**) and insufficient to affect water body status. There is, therefore, no mechanism for this change to affect the SAC.
Minsmere – Walberswick Special Protection Area (SPA)	The proposed change to the design of the SSSI crossing is located approximately 1.75km to the south of the SPA. Any impacts associated with the new bridge would be highly localised (cf. **Section 2.4b)**) and insufficient to affect water body status. There is, therefore, no mechanism for this change to affect the SPA.

2.4.26 This demonstrates that the revised SSSI crossing design would not result in any adverse impacts on the Protected Areas associated with the Leiston Beck water body.

f) Summary of impacts

2.4.27 The previous sections demonstrate that, although the proposed construction activities could result in temporary and/or highly localised effects on hydromorphology and biology, any changes are not considered to be sufficient to result in deterioration in the status of any quality elements in Leiston Beck (within or between status classes). Furthermore, any effects on mitigation measures identified for the water body would not prevent the implementation or counteract the effects of these measures, or adversely affect Protected Areas linked to the water body. This means that the proposed design change would not result in deterioration in the status of this river water body or prevent WFD objectives being achieved in this water body in the future.

2.4.28 Because any impacts on the hydromorphology, physico-chemistry and biology of Leiston Beck are not considered to be sufficient to result in deterioration in water body status, it can also be concluded that the proposed activities would not impact upon the status of the downstream river water body (Minsmere Old River) or underlying groundwater body (Waveney and East Suffolk Chalk and Crag).

2.5 Pakenham fen meadow habitat creation

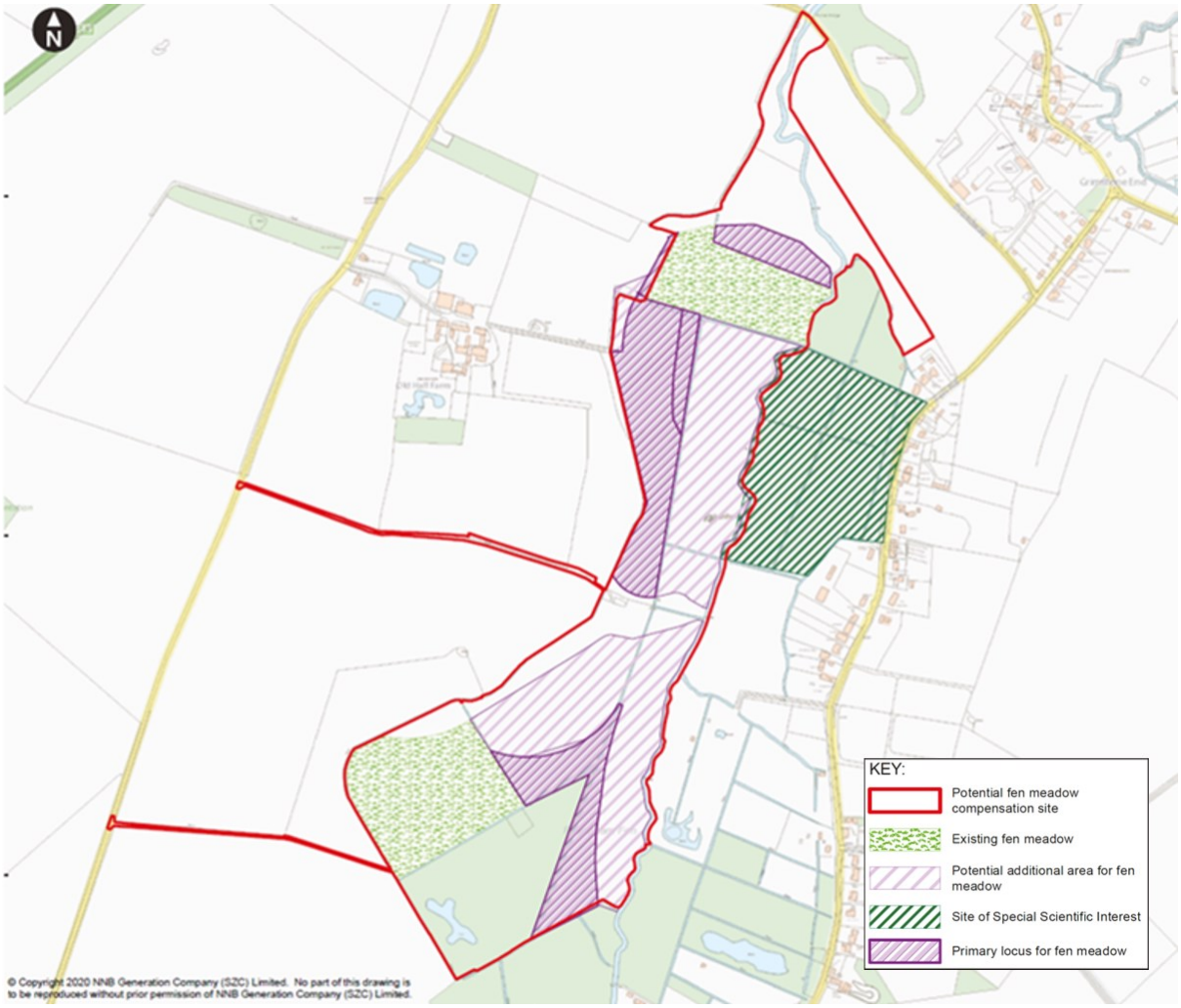
a) Changes to proposed design

2.5.1 An additional site at Pakenham (West Suffolk) has been identified as an option for creating fen meadow. The proposed site has an area of approximately 32ha and currently comprises a mix of grassland, fen meadow, rush pasture and drier grassland and is adjacent to the designated Pakenham Meadows SSSI for which lowland wet grassland and fen meadow are the primary interest features (**Plate 2.3**)

2.5.2 The site has been identified as being potentially suitable as it lies in a shallow basin bisected by the Pakenham Stream, and is in close proximity to other areas of fen meadow habitat. The site can be distinguished as two parts, ‘north’ and ‘south’, that lie either side of a ‘tongue’ of upland that divides the surface hydrology. A total of 4.9ha is considered the primary area for the creation of new fen meadow habitat, and some of the wider areas on the site may also have the potential for the creation of new fen meadow habitat.

2.5.3 The primary area for fen-meadow creation in the north part of the site is along the western slope and around the north side of an existing area of fen meadow, which together comprise an approximate area of 3.2ha. If control is exerted over the central drain, then large areas of rush pasture and improved grassland also have the potential to act as fen meadow compensation.

Plate 2.3: Proposed fen meadow habitat creation area



2.5.4 The greatest potential for developing fen meadow on the south part of the site lies in controlling the internal ditches connected to the central drain, which would encompass an approximate area of 1.7ha. The potential also exists to detain water in the topsoil within the surrounding improved grassland. Further studies will be undertaken to confirm suitability.

2.5.5 Works to create the fen meadow habitat at Pakenham would be similar to those described in **Volume 2**, **Chapter 3 Description of Construction** of the **ES** (Book Ref. 6.3) [APP-184] in relation to Benhall and Halesworth, commencing at the outset of construction on the main development site, and could include the following measures:

- Installation of water control structures, to maintain / manipulate water levels.

- Removal of any existing field drains, to reverse historic patterns of drainage.
- Local excavation to reduce local ground levels, create low bunds and /or create minor surface watercourses to help distribute surface water and reduce nutrient levels.
- Translocations of some turfs from the fen meadow areas of the Sizewell Marshes SSSI that would otherwise be lost through construction works.
- Limited planting of other locally sourced native species and use of appropriately sourced 'green hay' from Sizewell Marshes SSSI or potentially adjacent Pakenham Fen SSSI to accelerate colonisation by key fen meadow species.
- A number of potential access points between existing roads and the site would be required to enable access to the site by construction vehicles and workers.

b) Potentially affected water bodies

2.5.6 The proposed fen meadow creation site is located within the Pakenham Stream river water body (GB105033043300), adjacent to the left bank of the watercourse (**Figure 2.1**). Pakenham Stream is a heavily modified water body that is currently at Moderate Ecological Potential as a result of a moderate or less mitigation measures assessment, low dissolved oxygen concentrations and high phosphate concentrations (Ref.3). This is likely to be due to high nutrient loadings from treated sewage effluent. The water body is also failing to meet Good Chemical Status due to high concentrations of polybrominated diphenyl ethers (PBDEs). The morphology of the Pakenham Stream is of sufficient quality to support good status (Ref.3).

2.5.7 Pakenham Stream drains into the Sapiston River (GB105033043070), approximately 1.75km downstream of the proposed habitat creation area (**Figure 2.1**). This water body is also heavily modified and is currently at Moderate Ecological Potential as a result of a moderate or less mitigation measures assessment, high phosphate concentrations and pressures on macrophytes. The water body is also failing to meet Good Chemical Status due to high concentrations of polybrominated diphenyl ethers (PBDEs) (Ref.3).

2.5.8 The proposed habitat creation site is underlain by the Cam and Ely Ouse Chalk groundwater body (GB40501G400500) (**Figure 2.1**). The water body is at poor quantitative status as a result of the impacts of groundwater abstraction on groundwater-dependent terrestrial ecosystems, and at poor chemical status due to nutrient discharges from agriculture and water

treatment which cause a failure of the general chemical and chemical drinking water protected area tests (Ref.3).

2.5.9 The assessment presented in the subsequent sections is based on the latest water body classification data, which was published by the Environment Agency in September 2020 (Ref.3).

c) Potential impacts on water body status

i. Impacts on Pakenham Stream during construction and operation

2.5.10 The additional site identified at Pakenham is in close proximity to existing areas of fen meadow habitat and is considered to have suitable hydrological regimes which could be modified to produce the required conditions to support fen meadow. Further work is ongoing to develop site-specific plans to maximise the likelihood of successful fen meadow establishment. However, as a result of existing suitability, only relatively minor works are required to support this habitat, including excavation to remove existing land drainage and locally reduce ground levels, and the installation of structures to control water levels.

2.5.11 There is opportunity for the proposal to deliver significant beneficial effects to the surface water environment. However, there are risks of adverse impacts through changes in land drainage and morphological processes during the creation of the fen meadow habitat. Stripping of topsoil, vegetation clearance, stockpiling, earthworks and associated machine movements could potentially result in the supply of fine sediment and contaminants such as oils and fuel from construction plant into Pakenham Stream during the construction phase. However, the control measures embedded in the **Code of Construction Practice** (Doc Ref. 8.11) [APP-615] would ensure that site drainage is controlled and that there are no untreated discharges to water. This will ensure that there would be no deterioration in physico-chemistry or chemistry as a result of construction activities. Physical effects, including erosion and sediment transport associated with earthworks are anticipated to be minimal, and no impacts on hydromorphological quality elements are expected during construction.

2.5.12 There is potential for long-term impacts on the conveyance of flows through the surface drainage network within the floodplain following completion of the fen meadow and the installation of new control structures in the floodplain drainage network. The local effect would be to reduce the overall effectiveness of drainage within the site, thereby retaining more water within floodplain wetland habitats. However, it is anticipated that the design would complement the existing floodplain and river channel habitats. Any changes are unlikely to result in significant changes to the hydrological regime at water body scale and are, therefore, considered to be beneficial, locally

contributing to improved floodplain connectivity and slowing hydrological response times.

2.5.13 Any changes to hydromorphology or physico-chemistry are, therefore, likely to be limited and as such there is unlikely to be any deterioration in the status of the biological quality elements during construction or operation. Indeed, it is possible that the status of the biological quality elements (e.g. invertebrates) could improve as a result of the creation of new habitats adjacent to the watercourse. Furthermore, the creation of new wetland habitats could create a new phosphorus sink in the catchment, thereby contributing towards a reduction in phosphate concentrations and, potentially, an improvement in physico-chemical status.

2.5.14 Based on the assessment presented above, the potential effects of the construction and operation of the Pakenham fen meadow habitat creation on the Pakenham Stream water body are not predicted to be sufficient to result in deterioration in the status of any hydromorphological, physico-chemical or biological quality elements.

ii. Impacts on connected water bodies

2.5.15 As a result of the limited scope and spatial extent of any impacts on the hydromorphology, physico-chemistry and biology of Pakenham Stream and the fact that the activities would be located 1.75km upstream, there are not predicted to be any adverse impacts on the status of the downstream Sapiston River water body.

2.5.16 Furthermore, the proposed fen meadow habitat creation is not expected to result in a reduction in the interaction between surface and groundwater, or introduce a new source of contaminants into the Cam and Ely Ouse Chalk groundwater. Moreover, the creation of a new wetland could potentially contribute favourably to a reduction in phosphate concentrations and an improvement in groundwater-dependent terrestrial ecosystems in the catchment, and as such could contribute towards an improvement in the status of the groundwater body.

d) Potential impacts on RBMP mitigation measures

2.5.17 The RBMP highlights a range of mitigation measures for Pakenham Stream, which are largely focussed on reducing the impacts of sediment and vegetation management and reducing the impacts associated with recreational boating. The RBMP also identifies measures to increase in-channel morphological diversity, rehabilitate banks, set back flood embankments and increase floodplain connectivity (Ref.3).

2.5.18 The proposed creation of fen meadow habitat adjacent to the Pakenham Stream is designed to be an environmental enhancement. It is, therefore,

considered unlikely that it would counteract or prevent the future implementation of any of the mitigation measures identified for the water body in the RBMP. Indeed, it could potentially contribute towards measures to improve floodplain connectivity if floodplain wetlands are created as part of the final scheme.

e) Potential impacts on Protected Areas

2.5.19 The proposed fen habitat creation site is adjacent to the Pakenham Fen SSSI, and the two areas are likely to be hydrologically connected through the Pakenham Stream. It is recognised that the development of the proposals for habitat creation at the site and any future management of the site will need to ensure these existing areas of fen meadow habitats are not put at risk by, for example, disruption of the existing water supply mechanisms.

2.5.20 The fen meadow habitat creation at Pakenham has the potential to impact on the Ely Ouse and Cut-Off channel NVZ (S390), designated under the Nitrates Directive. However, no increase to nitrate use is proposed as a result of the construction or operation of the fen meadow habitat creation, and any reversion from arable land to fen habitats would decrease the use and runoff of nitrates from any parts of the site used for productive agriculture. No impacts on the NVZ are expected.

f) Summary of impacts

2.5.21 The previous sections demonstrate that the proposed fen meadow habitat creation would not result in deterioration in the status of the hydromorphology, physico-chemistry, biology or chemistry of Pakenham Stream (within or between status classes). Furthermore, the proposals would not prevent the implementation or counteract the effects of mitigation measures identified in the RBMP, or adversely affect Protected Areas linked to the water body. This means that the proposed change would not result in deterioration in the status of this river water body or prevent WFD objectives being achieved in this water body in the future.

2.5.22 Because any impacts on Pakenham Stream are not considered to be sufficient to result in deterioration in water body status, it can also be concluded that the proposed activities would not impact upon the status of the downstream river water body (Sapiston River) or underlying groundwater body (Cam and Ely Ouse Chalk).

2.6 Summary of WFD compliance implications of proposed design changes

2.6.1 The screening assessment presented in **Section 2.2** demonstrates that the majority of the proposed design changes would not result in additional

impacts which could affect water body status or change the conclusions of **Parts 2** and **3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621 and APP-622]. However, a requirement for further assessment to assess the WFD compliance implications of proposed changes to the design of the permanent BLF, construction and operation of a new BLF and changes to design of the SSSI crossing and the addition of a new area of fen meadow habitat creation at Pakenham was identified.

2.6.2 **Sections 2.3 - 2.5** of this assessment demonstrate that the proposed design changes would not result in any deterioration in water body status, impacts on RBMP mitigation measures or impacts on Protected Areas.

2.6.3 Given that there are no significant changes to the effects identified in **Parts 2** and **3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621 and APP-622], there would be no alterations to the findings of the assessment of cumulative effects presented in **Part 4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-623].

2.6.4 There are, therefore, not anticipated to be any changes to the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].

3 ADDITIONAL INFORMATION

3.1 Overview of additional information

3.1.1 This section presents a summary of additional information to support the assessment of WFD compliance that has been prepared since **Parts 2**, **3** and **4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623] were submitted alongside the DCO submission. This information includes:

- Updated water body classification data published by the Environment Agency in September 2020 (Ref.3). The implications of these updates are summarised in **Section 3.2**.
- Updates to the assessment with regards to fish impingement and entrainment, smelt and stock areas. This additional information is summarised in **Section 3.3**.
- Updates to the assessment of the potential impacts of fen meadow habitat creation to consider the correct site locations. This is provided in **Section 3.4**.
- An initial assessment of the potential impacts of the proposed new mains water supply to the site during construction and operation. This is provided in **Section 3.5**.

3.2 Updated water body classification data

a) Introduction

3.2.1 **Parts 2**, **3** and **4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623] used water body classification data provided by the Environment Agency as a baseline against which the potential impacts of the proposed development were assessed. These data, which are summarised in **Part 2 Appendix 2A** and **Part 3 Appendix 3A** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-626 and APP-627], were last updated in 2016 and as such represented the most recent data available at the time the assessment was undertaken.

3.2.2 However, the Environment Agency published the 2019 update of the WFD classification data on the Catchment Data Explorer in September 2020 (Ref.3). This section therefore presents an analysis of whether any changes to baseline WFD status classification would have any implications for the conclusions of **Parts 2**, **3** and **4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].

b) Changes to water body status

3.2.3 The original screening (Stage 1) assessments presented in **Parts 2** and 3 of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621 and APP-622] identified that 19 water bodies could potentially be affected by the main development site and associated development sites. The full 2019 classification data for each water body is presented in **Appendix A** of this **WFD Compliance Assessment Addendum**, and changes between 2016 and 2019 are summarised in **Table 3.1**.

3.2.4 **Table 3.1** also includes commentary regarding whether any changes in the baseline alter the output of the original assessment.

3.2.5 To summarise, the status of some of the biological, physico-chemical and hydromorphological quality elements supported in the water bodies that could be affected by the scheme has improved between 2016 and 2019, while others have declined. However, the impacts that are anticipated to occur as a result of the proposed development are considered unlikely to counteract improvements or further exacerbate decreases in the status of individual quality elements.

3.2.6 The chemical status of all surface water bodies considered in this assessment has decreased from Good to Fail between 2016 and 2019. This is largely due to concentrations of polybrominated diphenyl ethers (PBDEs) and mercury and its compounds. In freshwater bodies, neither of these parameters were included in previous classifications. For marine water bodies, PBDEs is also a new parameter but mercury compliance has changed and is now assessed against an Environmental Quality Standard (EQS) for biota which is more sensitive to mercury concentrations in the environment.

3.2.7 For freshwater bodies, activities would not release any concentrations of these contaminants and therefore the output of the original assessment is not altered. For marine water bodies, whilst mercury would be discharged during groundwater dewatering via the CDO and via the operational outfall as a result of the cooling water discharge, the alteration in the compliance assessment method does not alter the findings of the H1 assessment presented in the original assessment. As for freshwater bodies, PBDEs would not be released to marine water bodies by the proposals.

3.2.8 Changes to the ecological and chemical status of the water bodies are therefore not considered to affect the conclusions of **Parts 2**, **3** and **4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].

Table 3.1: Change in water body status classifications between 2016 and 2019

Water body name and ID	Changes 2016-2019 (Ref.3)	Implications for WFD compliance assessment
Alde - Ore (d/s confluence) (GB105035045950)	Ecological status decreased from Moderate in 2016 to Poor in 2019. Fish decreased from Moderate to Poor, but all other biological quality elements remain unchanged. Dissolved oxygen decreased from Moderate to Poor, but all other physico-chemical quality elements remain unchanged. There were no changes in hydromorphology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	All potential impacts to this water body were screened out in **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] due to the distance downstream from the southern park and ride, two village bypass and Sizewell link road. Changes to the baseline will not therefore affect the decision to screen out the water body.
Alde & Ore (GB520503503800)	Ecological status did not change between 2016 and 2019, remaining Moderate. Fish decreased from Good to Moderate, but all other biological quality elements remain unchanged. There were no changes in physico-chemistry or hydromorphology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	**Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] determined that this water body could potentially be affected by discharges from the operational power station and associated impacts on fish populations moving and/or migrating along the coast. However, the proposed discharges would not result in the release of PBDEs or mercury compounds above the limits acceptable under the WFD (**Section 2.5k)** of **Part 2**) or present a significant barrier to fish moving between the coastal water body and connected transitional water bodies (**Section 2.5)** of **Part 2**). Changes to the ecological and chemical status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].

Water body name and ID	Changes 2016-2019 (Ref.3)	Implications for WFD compliance assessment
Blyth (S) (GB510503503700)	Ecological status did not change between 2016 and 2019, remaining Moderate. There were no changes in biology, physico-chemistry or hydromorphology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	**Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] determined that this water body could potentially be affected by discharges from the operational power station and associated impacts on fish populations moving and/or migrating along the coast. However, the proposed discharges would not result in the release of PBDEs or mercury compounds above the limits acceptable under the WFD (**Section 2.5k)** of **Part 2**) or present a significant barrier to fish moving between the coastal water body and connected transitional water bodies (**Section 2.5)** of **Part 2**). Changes to the ecological and chemical status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].
Bucklesham Mill River (GB105035040280)	Ecological status improved from Poor in 2016 to Good in 2019. Overall biology moved from Poor to Good, as did fish. However, invertebrates declined from High to Good. Physico-chemistry improved from Good to High, reflecting a similar improvement in dissolved oxygen. There were no changes in hydromorphology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	All potential impacts to this water body were screened out in **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] due to the lack of hydrological connectivity between the water body and the freight management facility. Changes to the baseline will not therefore affect the decision to screen out the water body.
Coddenham Watercourse (GB105035046100)	Ecological status did not change between 2016 and 2019, remaining Moderate. Although hydromorphology continues to support Good,	All potential impacts to this water body were screened out in **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] due to the minor nature of highway

Water body name and ID	Changes 2016-2019 (Ref.3)	Implications for WFD compliance assessment
	hydrological regime declined from High to Does Not Support Good. There were no changes to physico-chemistry, and no data are provided for biology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	improvement activities undertaken in the catchment. Changes to the baseline will not therefore affect the decision to screen out the water body.
Deben (GB520503503900)	Ecological status did not change between 2016 and 2019, remaining Moderate. There were no changes in biology, physico-chemistry or hydromorphology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	All potential impacts to this water body were screened out in **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] due to the distance downstream from the southern park and ride. Changes to the baseline will not therefore affect the decision to screen out the water body.
Felixstowe Peninsula Crag & Chalk (GB40501G401800)	Quantitative status declined from Good to Poor between 2016 and 2019, reflecting a decline in the quantitative water balance from Good to Poor. All other quantitative quality elements remained unchanged at Good. Chemical status remained unchanged at Poor, although the Chemical Groundwater-Dependent Terrestrial Ecosystems test declined from Good to Poor. All other chemical quality elements remained unchanged at Good.	**Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] determined that the water body could potentially be impacted by the supply of contaminants during construction and operation of the freight management facility. However, the control measures set out in the **Code of Construction Practice** (Doc Ref. 8.11) [APP-615] and **Outline Drainage Strategy** (**Appendix 2A** of **Volume 2** of the **ES**; Doc Ref 6.3) [APP-181] would minimise impacts and prevent deterioration in water body status. Changes to the status of the water body are therefore not considered to affect the conclusions of the **WFD compliance assessment**.

Water body name and ID	Changes 2016-2019 (Ref.3)	Implications for WFD compliance assessment
Hundred River (GB105035046260)	Ecological status did not change between 2016 and 2019, remaining Moderate. There were no changes in biology, physico-chemistry or hydromorphology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	All potential impacts to this water body were screened out in **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] because the proposed rail extension route would be confined to a very small proportion of the water body catchment that is poorly connected to the drainage network. Changes to the baseline will not therefore affect the decision to screen out the water body.
Leiston Beck (GB105035046271)	Ecological status did not change between 2016 and 2019, remaining Moderate. Biology decreased from Good to Moderate; macrophytes and phytobenthos were not recorded in 2016, but were classified as Moderate in 2019. Physico-chemistry remained Moderate, although ammonia decreased from Good to Moderate and phosphate improved from Poor to Moderate. There were no changes in hydromorphology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	**Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] determined that this water body could potentially be affected by the supply of sediment and contaminants during construction (**Section 2.5h)**), changes to surface drainage and groundwater levels (**Sections 2.5i)** and **2.5m)**), and physical modification as a result of the proposed SSSI crossing (**Section 2.5n)**). However, the control measures set out in the **Code of Construction Practice** (Doc Ref. 8.11) [APP-615] would prevent the supply of ammonia, PBDEs, mercury compounds and other contaminants and avoid deterioration in water body status during construction. Furthermore, the water level control measures set out in the **Outline Drainage Strategy** (**Appendix 2A** of **Volume 2** of the **ES**) (Doc Ref 6.3) [APP-181], including control structures on Sizewell Drain, would minimise impacts and prevent deterioration in water body status during construction and operation. Although the revised design for the bridge deck at the SSSI crossing (cf. **Section 2.4**) could potentially alter light conditions, the size of the aperture means that light

Water body name and ID	Changes 2016-2019 (Ref.3)	Implications for WFD compliance assessment
		will still be able to penetrate beneath some the structure and that any changes in light levels will be gradual rather than abrupt. However, the structure will be 6-8m in height and approximately 45m in width so it is likely that the area underneath the centre of the structure will be in deep shade. This would affect vegetation composition within the shadow of the bridge to more shade tolerant species underneath the margins of the bridge to a potential absence of vegetation in the middle (Doc Ref. 8.11(A)A). However, the increase in shading will affect a maximum of 69m, which represents 1.59% of the water body and is therefore unlikely to result in status deterioration for macrophytes or phytobenthos. Changes to the ecological and chemical status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].
Minsmere Old River (GB105035046270)	Ecological status did not change between 2016 and 2019, remaining Moderate. Physico-chemistry decreased from Good to Moderate; dissolved oxygen was recorded as Good in 2016 but had decreased to Poor in 2019, and phosphate improved from Good to High. There were no changes in biology or hydromorphology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	**Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] determined that this water body could potentially be affected by the supply of sediment and contaminants during construction of the main development site (**Section 2.5h)**) and associated changes to surface drainage and groundwater levels (**Sections 2.5i)** and **2.5m)**). **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] demonstrated that the northern park and ride (**Section 3.4**), Sizewell link road (**Section 3.7**), highways (**Section 3.8**) and rail improvements (**Section 3.9**) could also affect the supply of sediment and contaminants and change drainage patterns. Furthermore, the Sizewell link road

Water body name and ID	Changes 2016-2019 (Ref.3)	Implications for WFD compliance assessment
		(**Section 3.4**) could also result in direct physical modifications to tributaries of the watercourse. However, the control measures set out in the **Code of Construction Practice** (Doc Ref. 8.11) [APP-615] and **Outline Drainage Strategy** (**Appendix 2A** of **Volume 2** of the **Envrionmental Statement**) (Doc Ref 6.3) [APP-181] would minimise impacts on hydromorphology (e.g. by preventing significant changes to hydrological regime) and physico-chemistry (e.g. by preventing the supply of PBDEs, mercury compounds and other contaminants) and avoid deterioration in water body status. Changes to the ecological and chemical status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].
River Alde (GB105035046060)	Ecological status improved from Poor to Moderate between 2016 and 2019, remaining Moderate. However, biology improved from Poor to Moderate; fish moved from Poor to Moderate, but invertebrates declined from High to Good. Although physico-chemistry remained Moderate, phosphate improved from Good to High. There were no changes in hydromorphology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	**Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] determined that the water body could potentially be impacted by direct physical modification of the watercourse, changes to surface drainage and the supply of contaminants during construction and operation of the two village bypass. The proposed two village bypass across the River Alde avoids direct interaction with the bed and banks of the watercourse, and as such will not affect the hydromorphology of the water body. Furthermore, it will not result in adverse impacts on fish and invertebrates, given that the main river would be crossed by a clear span bridge that would not directly disturb the bed and banks. Lower light levels and a change in vegetation

Water body name and ID	Changes 2016-2019 (Ref.3)	Implications for WFD compliance assessment
		composition could reduce the diversity of aquatic invertebrate species that live within the shadow of the bridge, however aquatic invertebrates would still be able to drift through the watercourse, actively or passively, and travel along bankside vegetation (Doc Ref. 8.11(A)A). The bridge is therefore unlikely to cause fragmentation of invertebrate populations either side of the structure. Portal culverts would be used to minimise impacts on connected minor watercourses, preserving the integrity of substrates, preventing changes to the sediment and hydrological regimes, and minimising impacts on fish and invertebrates. The control measures set out in the **Code of Construction Practice** (Doc Ref. 8.11) [APP-615] and **Outline Drainage Strategy** (**Appendix 2A** of **Volume 2** of the **ES**) (Doc Ref 6.3) [APP-181] would minimise impacts with construction and changes to drainage, and prevent deterioration in water body status. Furthermore, the proposed development would not increase the supply of phosphates, PBDEs and mercury compounds. Changes to the ecological and chemical status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].
River Deben (Brandeston Bridge - Melton) (GB105035046310)	Ecological status did not change between 2016 and 2019, remaining Moderate. Physico-chemistry remained Moderate, although dissolved oxygen declined from Good to Bad. Hydrological regime also	**Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] determined that the water body could potentially be impacted by changes to surface drainage and the supply of contaminants during construction and operation of the southern park and ride. However, the control measures set out in the **Code of Construction**

Water body name and ID	Changes 2016-2019 (Ref.3)	Implications for WFD compliance assessment
	declined such that it no longer supports Good. There were no changes in biology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs, perfluorooctanesulphonate (PFOS) and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	**Practice** (Doc Ref. 8.11) [APP-615] and **Outline Drainage Strategy** (**Appendix 2A** of **Volume 2** of the **ES**) (Doc Ref 6.3) [APP-181] would minimise impacts and prevent deterioration in water body status. Changes to the ecological and chemical status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].
River Fromus (GB105035045980)	Ecological status did not change between 2016 and 2019, remaining Poor. Biology remained Poor, although invertebrates improved from Moderate to Good. Physico-chemistry remained Moderate, although phosphate improved from Poor to Moderate. There were no changes in hydromorphology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	**Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] determined that the water body could potentially be impacted by changes to surface drainage and the supply of contaminants during construction and operation of the two village bypass. However, the control measures set out in the **Code of Construction Practice** (Doc Ref. 8.11) [APP-615] and **Outline Drainage Strategy** (**Appendix 2A** of **Volume 2** of the **ES**) (Doc Ref 6.3) [APP-181] would minimise impacts and prevent deterioration in water body status. Changes to the chemical status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].
River Lark (GB105035040360)	Ecological status did not change between 2016 and 2019, remaining Moderate. There were no changes in biology, hydromorphology or physico-chemistry. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in	All potential impacts screened out in **Part 3** of the **WFD Compliance Assessment** (Doc Ref 8.14) [APP-622] due to the minor nature of highway improvements undertaken in the catchment. Changes to the baseline will not therefore affect the decision to screen out the water body.

Water body name and ID	Changes 2016-2019 (Ref.3)	Implications for WFD compliance assessment
	2019. All other chemical quality elements remain unchanged.	
River Ore (GB105035045970)	Ecological status did not change between 2016 and 2019, remaining Poor. Biology remained Poor, although invertebrates improved from Good to High. There were no changes in hydromorphology or physico-chemistry. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	**Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] determined that the water body could potentially be impacted by changes to surface drainage and the supply of contaminants during construction and operation of the southern park and ride. However, the control measures set out in the **Code of Construction Practice** (Doc Ref. 8.11) [APP-615] and **Outline Drainage Strategy** (**Appendix 2A** of **Volume 2** of the **ES**) (Doc Ref 6.3) [APP-181] would minimise impacts and prevent deterioration in water body status. Changes to the chemical status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].
Suffolk (GB650503520002)	Ecological status did not change between 2016 and 2019, remaining Moderate. There were no changes in biology or physico-chemistry. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	**Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] identified potential effects in relation to marine construction (**Section 2.5(j)**), the operation of marine structures (**Section 2.5(o)**) and construction and operational discharges (**Sections 2.5k)**, **2.5l)**, **2.5q)**, **2.5r)** and **2.5s)**). Dredging and sediment disturbance could increase levels of PBDEs if present in the sediment, but the localised and temporary nature of the sediment plume would not lead to a long term effect on this parameter. Construction and operational discharges would not release additional concentrations of PBDEs and mercury is already assessed as part of the H1 assessment following

Water body name and ID	Changes 2016-2019 (Ref.3)	Implications for WFD compliance assessment
		Environment Agency guidance. As a result, the conclusions of the original assessment are not altered by the changes in the water body baseline. Changes to the chemical status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].
Walberswick Marshes (GB610050076000)	Ecological status did not change between 2016 and 2019, remaining Good. There were no changes in supporting quality elements. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	Given the above for the Suffolk coastal water body, effects on this water body (which is in continuity with the coastal water body) would not alter the conclusions of the original assessment presented in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]. Changes to the chemical status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].
Waveney & East Suffolk Chalk and Crag (GB40501G400600)	Quantitative status did not change between 2016 and 2019, remaining Poor. Although the quantitative water balance improved from Poor to Good, the status of groundwater-dependent surface water bodies declined from Good to Poor. Chemical status remained unchanged at Poor, with no changes in any chemical quality elements.	As set out in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621], there are minimal changes predicted in both groundwater and surface waters as a result of the construction and operational presence of the platform. The greatest impacts on groundwaters are confined to construction-stage dewatering and subsequent short-term recovery, and no discernible changes to flows in connected groundwater-dependent surface waters are expected. Changes to the baseline status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].

Water body name and ID	Changes 2016-2019 (Ref.3)	Implications for WFD compliance assessment
Wenhaston Watercourse (GB105035046010)	Ecological status did not change between 2016 and 2019, remaining Moderate. There were no changes in biology, physico-chemistry or hydromorphology. Chemical status decreased from Good in 2016 to Fail in 2019. PBDEs and mercury compounds were not measured in 2016, but were recorded as failing in 2019. All other chemical quality elements remain unchanged.	All potential impacts to this water body were screened out in **Part 3** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-622] due to lack of hydrological connectivity with the northern park and ride and highways improvements. Changes to the chemical status of the water body are therefore not considered to affect the conclusions of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623].

3.3 Fish in transitional and coastal water bodies

a) Additional assessment description and supporting documentation

3.3.1 There is potential that the entrapment during cooling water abstraction may cause a deterioration to the fish element in the Alde & Ore (GB520503503800) and Blyth (S) (GB510503503700) transitional water bodies. The species of greatest concern is the smelt *Osmerus eperlanus*, a key indicator species under the WFD. A reduction in other fish species which feature in the Alde-Ore water body would also contribute to a deterioration in the status of this water body.

3.3.2 Additional assessments of the potential impacts of the proposed development on fish impingement and entrainment have therefore been undertaken since the application was made. Assessments to address the specific detail regarding smelt and stock areas used in the assessment have also been undertaken. The specific changes and additions can be summarised as follows:

- An updated Low Velocity Side Intake (LVSE) factor has been applied to the data as a result of model refinement. This revises the factor from 0.383 per cumec to 0.357 per cumec (see BEEMS Scientific Position Paper SPP099 v4 (Ref.8) for further detail).
- Sizewell B impingement predictions have been updated with an additional step to account for periods when sampling was not possible due to station outages (see BEEMS Technical Report TR339 v3 (Ref.9) for further detail).
- A sensitivity analysis has been carried out on the impingement predictions to account for uncertainties in defining assessment parameters including LVSE efficiency, Fish Recovery and Return system (FRR) mortality, Equivalent Adult Value (EAV) values and changes in distributions of fish.
- Inclusion of a local level effects assessment to account for WFD water body classification requirements.

3.3.3 Supporting this summary are a number of technical reports and position papers which provide the detailed evidence to the updated **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621, APP-622 and APP-623]. These are:

- TR406 r7 Sizewell C – Impingement predictions based upon specific cooling water system design (Ref.10). This document is the overarching fish entrapment assessment summarising output and evidence gathered to support the assessment.

- SPP101 Implications of tidal elevation and temperature on smelt, impingement at Sizewell (Ref.11).
- SPP102 Use of Spawning Production Foregone EAVs for impingement assessment (Ref.12).
- SPP103 Consideration of potential effects on selected fish stocks at Sizewell (Ref.13).
- SPP108 Sensitivity of the Alde Ore Transitional Fish Classification Index (TFCI) to changes in smelt abundance (Ref.14).

3.3.4 Given the revisions to the various assessments regarding impingement and entrainment, the potential effects associated with the FRR system alter in relation to discharge of polluting matter as a direct consequence and therefore this revised assessment is also presented here. The supporting evidence for this assessment is presented in TR520 (Ref.15).

b) Summary of changes to the output of the **WFD compliance assessment**

i. Mitigation measures

3.3.5 There are no changes to the mitigation measures proposed to reduce the effects of entrapment; these are the inclusion of the LVSE intake heads and installation of the FRR system. It is also confirmed that chlorination would not be applied until after the drum screens thus removing chlorination from the FRR system. Further detail on reasons for the proposed mitigation measures and why other measures are not viable is provided in TR406 r7 (Ref.10).

3.3.6 The predicted reductions in mortality reduction for Sizewell C with LVSE intake heads and the FRR system in place are presented in **Table 3.2**.

Table 3.2: Summary of mortality reduction with mitigation measures in place

Group	Example species	Impingement reduction
Pelagic fish	Sprat, herring, anchovy, shad	64%
Demersal fish	Bass, cod, whiting, grey mullet	78-80%
Epibenthic fish	Eel, lampreys, sole, sand goby	93%
Shellfish	Crab, brown shrimp	93%

ii. Impingement assessment

3.3.7 As detailed in **Section 2.5r)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] the predicted losses incurred by Sizewell C are calculated by raising the mean, lower and upper 95% percentile predictions for Sizewell B by the ratio of the two pumping capacities for each species.

3.3.8 The predicted effect of the proposed LVSE intake head design is then applied by multiplying all predicted values by the revised 0.357 factor. For each species, the proportion of fish that would be retained by the 75mm trash rack is then applied to the number of fish that pass through the intake head, giving the number of fish lost to the trash racks.

3.3.9 Fish passing through the trash racks will then go on to encounter the drum or band screens. To calculate drum screen and band screen losses, the number of fish remaining after passage through the trash racks is apportioned into those that will encounter the drum screens and those that will encounter the band screens based on the proportion of water flowing through each (drum screens = 91%; band screens = 9% of the cooling water). The proportion of numbers of fish that would be retained by the drum and band screens is calculated for each species separately.

3.3.10 Two issues not discussed in the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] are the consideration of overloading of the FRR system by dead fish that do not survive the recovery process causing oxygen depletion in part of the system where fish densities are highest and the clogging of the FRR system by ctenophore blooms in the summer. Consideration of these issues in TR406 r7 (Ref.10), however, concluded that these would have negligible effect on fish survival due to design allowing the screens to increase rotation rate in response to different screen loadings (which allows quicker return to sea via the FRR), the larger (10mm) mesh filters (increased entrainment) and use of LVSE intake heads. Additionally, the rotation path lengths of the drum and band screens will be smaller than those deployed at Hinkley Point C due to the smaller tidal range at Sizewell and therefore fish residence times in the fish buckets will be shorter.

3.3.11 EAVs are then used to adjust the number of lost juveniles to a corresponding number of lost adults. The reasoning for the EAV method detailed in **Section 2.5r)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] rather than using the Spawner Production Foregone (SPF) method as suggested by the Environment Agency is presented in TR406 r7 (Ref.10) and an evaluation of the SPF EAV for an example species is presented in SPP102 (Ref.12).

3.3.12 As most stock information (particularly for commercially-exploited species) is given as weight rather than number of fish, the EAV numbers of

impingement losses are then converted to EAV weights (t), using values of mean weight per species. The final impact assessment method used depended on the data available for each species.

3.3.13 To evaluate the effect of Sizewell C impingement losses, ICES stock estimates were then used (see **Section 2.5r**) of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]. Additional information regarding applicability of ICES stock units is presented in TR406 r7 (Ref.10) and focus is given to bass given the concerns raised specifically regarding applicability to this species.

3.3.14 Additionally, stock units of various species have been reviewed (Ref.13) and as a result, fisheries landing data for dab, flounder and thornback ray have been modified. In the case of flounder, updated information on landings in the different sub-divisions of the North Sea (excluding Kattegat and Skagerrak) have been applied. For other species, alternative sources for population sizes, catches or landings were used. Revised data sources are summarised in **Table 3.3**. Where a species is not listed, there is no change from the information presented in **Section 2.5r)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621].

Table 3.3: Summary of changes to baseline data

Species	ICES working group	Stock unit	Assessment type	Impingement effect comparator
Dab	WGNSSK[1]	Revised stock area Subarea 4 (North Sea).	Trends only	Landings
Flounder	WGNSSK	Subarea 4 & 3.a (North Sea & Skagerrak and Kattegat). Minor revision to updated landings data	Trends only	Landings
Cucumber Smelt	-	Not defined but includes the East Anglian coast and rivers on the European	Estimated adult numbers migrating upriver	Elbe populations EA landings & ICES Landings

[1] Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak

Species	ICES working group	Stock unit	Assessment type	Impingement effect comparator
		coast from the Elbe to the Scheldt. Primary assessment is based on conservative UK landings and SSB.		
Thornback ray	WGEF[2]	Updated: Subarea 4 and Division 2.a (North Sea and Norway).	Trends only	Landings
Twaite shad	-	Belgian river Scheldt. A separate spawning population on the river Weser has not been included in the assessment. Revised population estimate.	Estimated adult numbers migrating upriver	European populations in the Elbe. ICES Landings
Eel	WGEEL[3]	Updated to SSB Anglian River Basin District (RBD)	Biomass estimated	Estimated silver eel biomass

3.3.15 The revised impingement predictions for finfish are presented in **Table 3.4** (note these account for mitigation measures in place). This replaces **Table 2.60** in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621].

[2] Working Group on Elasmobranch Fishes
[3] Joint EIFAAC/ICES/GFCM Working Group on Eels

3.3.16 The impingement predictions have been further considered for three species bass, thin-lipped grey mullet and European eel. A summary for each species is provided below:

- Bass: The density of bass is 20 times greater inshore of the Sizewell Dunwich Bank, in the vicinity of the Sizewell B thermal plume due to bass preferring the warmer water. The thermal plume for Sizewell C is considerably smaller and focussed at the surface therefore bass would not be attracted to the area impacted by the intakes. At depth, the water inshore of the Bank would be appreciably warmer than at the Sizewell C intakes and there is no reason to consider that the distribution of bass would materially change from the existing situation. Making a precautionary assessment that 90% of bass would remain inshore of the Bank (rather than the measured 95%) the expected bass impingement for Sizewell C is revised to 0.032% SSB.

- Thin-lipped grey mullet: It is considered that landings data will underestimate the SSB. As a result, a conservative assumption has been made that landings represent 20% of SSB (see TR406 for further detail). Using this figure, the predicted impingement is equivalent to approximately 0.18% SSB.

- European eel: Given the small scale of the yellow and silver eel fisheries along the Suffolk coast, the most appropriate indicator on local eel stocks is considered to be a comparison between impingement data for eels by life stage and, for fisheries, the combined mean yellow and silver eel catch for 2010-2017 (13.9 t). For the population comparator, the mean estimated silver eel production for the Anglian river basin district is 78.6t. Impingement numbers therefore equate to 0.093% of the estimated river basin biomass. This figure is an overestimate as due to the lack of necessary biological and population data, it has not been possible to derive an EAV for eel, so a worst-case value of 1 has been assumed. Accounting for natural mortality, the predicted impingement effect can be reduced by 50% to 0.047%. Entrapment of all eel life-stages is discussed in **Section 3.3b)iii**.

Table 3.4: Summary of updated impingement assessment for Sizewell C with inbuilt mitigation measures

Species	Mean Sizewell C prediction	Sizewell C prediction after intake and FRR adjustment	Prediction after application of EAV (number)	EAV weight (t)	Mean SSB	Percentage of SSB	Mean landings (t)	Percentage of landings
Sprat	6,920,815	2,470,731	1,856,146	19.50	220,757	0.01	NA	NA
Herring	2,607,016	930,705	665,658	125.59	2,198,449	0.01	NA	NA
Whiting	1,665,479	594,576	116,541	33.31	151,881	0.02	NA	NA
Bass	709,082	253,142	31,214	47.78	14,897	0.32	NA	NA
Sand goby	503,232	179,654	37,009	0.07	205,882,353[4]	0.02	NA	NA
Sole	233,942	83,517	3,663	0.78	43,770	0.00	NA	NA
Anchovy	176,816	63,123	61,489	1.28	NA	NA	1,625	0.08
Dab	143,519	27,591	12,267	0.50	NA	NA	5,309	0.01
Thin-lipped grey mullet	127,382	25,038	2,087	1.09	NA	NA	120	0.90
Flounder	37,303	3,075	1,420	0.12	NA	NA	2,321	0.01
Plaice	24,716	1,818	628	0.15	690,912	0.00	NA	NA
Smelt	20,795	7,424	5,653	0.09	50	0.19	8	NA
Cod	16,426	3,531	1,268	3.30	103,025	0.00	NA	NA
Thornback ray	7,460	549	106	0.34	NA	NA	1,573	0.09
Eel	3,031	223	223	0.07	79	0.15	41	0.79
Twaite shad	2,989	1,067	1,067	0.33	5,161,183	0.02	1	NA
River lamprey	2,929	215	215	0.02	62	0.03	NA	NA
Horse mackerel	1,779	635	635	0.09	NA	NA	21,442	0.00

[4] Estimate of population number or reported catch numbers

Species	Mean Sizewell C prediction	Sizewell C prediction after intake and FRR adjustment	Prediction after application of EAV (number)	EAV weight (t)	Mean SSB	Percentage of SSB	Mean landings (t)	Percentage of landings
Mackerel	473	169	169	0.05	3,888,854	0.00	NA	NA
Tope	70	5	5	0.04	NA	NA	498	0.01
Sea trout	10	4	4	0.01	NA	NA	39,795	0.01
Sea lamprey	5	0.36	0.36	0.00	NA	NA	NA	NA
Allis shad	3	1	1	0.00	27,397	0.00	NA	NA
Salmon	0	0	0	0.00	NA	NA	38,456	0.00

3.3.17 Of the 24 species considered, none exceeds the 1% threshold. This result is the same as that reported in **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621] and therefore there is no change to the conclusions that Sizewell C would not give rise to a within water body class deterioration.

iii. Entrapment assessment (impingement and entrainment)

3.3.18 This assessment has been revised in light of the changes to the impingement numbers calculated above. The results are presented in **Table 3.5**.

3.3.19 As in the original assessment, the results are similar to those obtained for impingement alone and only sand goby exceeds the 1% threshold. However, sand goby is an unexploited short-lived stock and, in such circumstances, the appropriate comparator is determined as 10% of the SSB (Ref.10). Furthermore, gobies are ubiquitous in the North Sea and the species is considered highly recoverable, given its high rate of growth and reproduction. As such the entrapment of sand goby in the context of the population assessed by the TFCI tool would not lead to a deterioration in the WFD water body.

Table 3.5: Annual mean entrapment predictions (with LVSE and FRR system in place)

Species	Impingement		Entrainment		Entrapment (impingement +entrainment)	
	Percentage of SSB	% of landings (t)	Percentage of SSB	Percentage of landings	% of SSB	% of landings
Sprat	0.01	0.01	0	0	0.01	0.01
Herring	0.01	0.03	0	0	0.01	0.03
Whiting	0.02	0.19	-	-	0.02	0.19
Bass	0.3	1.16	0	0	0.03	1.16
Sand goby	0.02	NA	1.40	0	1.42	0.00
Sole	0.00	0.01	0	0	0.00	0.01
Dab	NA	0.01	NA	0.01	NA	0.02
Anchovy	NA	0.08	NA	0.01	NA	0.09
Thin-lipped grey mullet	0.18	0.90	-	-	0.18	0.90
Flounder	NA	0.01	NA	0	NA	0.01
Plaice	0.00	0.00	-	-	0.00	0.00
Smelt	0.19	1.11	-	-	0.19	1.11
Cod	0.00	0.01	-	-	0.00	0.01
Thornback ray	NA	0.05	-	-	NA	0.05
River lamprey	0.03	1.53	-	-	0.03	1.53

Species	Impingement		Entrainment		Entrapment (impingement +entrainment)	
	Percentage of SSB	% of landings (t)	Percentage of SSB	Percentage of landings	% of SSB	% of landings
Eel	0.09	0.53	-	-	0.09	0.53
Twaite shad	0.02	25.07	-	-	0.02	25.07
Horse mackerel	NA	0.00	-	-	NA	0.00
Mackerel	0.00	0.00	-	-	0.00	0.00
Tope	NA	0.10	-	-	NA	0.01
Sea trout	NA	0.01	-	-	NA	0.01
Allis shad	0.00	0.47	-	-	0.00	0.47
Sea lamprey	NA	NA	-	-	NA	NA
Salmon	NA	0	-	-	NA	0.00

iv. Alde and Ore transitional water body

3.3.2 As a result of ongoing consultation with the Environment Agency, an assessment of the sensitivity of the WFD TFCI to manipulated reductions/removals of smelt, thin-lipped grey mullet, Dover sole, herring, seabass and twaite shad from monitoring data was undertaken. Full details of this assessment are presented in BEEMS Scientific Position Paper SPP108 (Ref.14).

3.3.3 To determine sensitivity to smelt, numbers were manipulated and the TFCI rerun to determine the effect removal of certain numbers would have, including complete absence. A further test was then undertaken which considered the absence of smelt and twaite shad and 50% reductions in herring and seabass. A final test then removed thin-lipped grey mullet and Dover sole, as well as a 50% removal of smelt, thin-lipped grey mullet and Dover sole simultaneously.

3.3.4 The conclusions are:

- The calculated Ecological Quality Ratio (EQR) was insensitive to the manipulated reductions in smelt abundance of 25 and 50%.
- Total absence of smelt reduced the EQR by 11% but was still within the category for good status.
- The absence of shad and smelt along with 50% reductions in herring and bass reduced the EQR by 10.3%, however, 'good' status remained
- Total absence of thin-lipped grey mullet and Dover sole reduced the EQR by less than 4% in each case and 'good' status remained.
- The status also remained 'good' following the combined 50% reduction of smelt, Dover sole and thin-lipped grey mullet.

3.3.5 Under all of the scenarios tested, there was no deterioration from 'good' status to 'moderate' or lower when the TFCI was recalculated. Given that it is not predicted that any of the scenarios outlined above are likely, it is concluded that the proposed development would not cause a deterioration in the fish classification status of the Alde & Ore transitional WFD water body.

v. Sensitivity analysis

3.3.6 TR406 r7 (Ref.10) presents additional information in relation to the sensitivity of the various parameters used in the assessment to the output of the results and covers LVSE efficiency, FRR mortality, EAV values and changes to the distribution of fish. In summary, the mean and 95th

percentile upper impingement estimates for the key species remained below the 1% threshold for SSB or fisheries landings, for all species except bass and European eel. As such, in the absence of mitigation no significant effects on stock viability are predicted. The mitigation options proposed will reduce the impingement further, thereby minimising effects. TR406 r7 (Ref.10) acknowledges that it is not possible to predict the precise mitigation efficiency on a species by species basis, however the assessment for most species is in-sensitive to uncertainties in the mitigation parameters.

3.3.7 In the case of bass, a combination of the LVSE intakes, FRR mitigation and applying knowledge of the distribution of bass within the Greater Sizewell Bay is anticipated to reduce effects to well below 1%.

3.3.8 In the absence of mitigation, losses of eel due to impingement equates to 1.27% of the Anglian river basin district SSB. Assuming no LVSE benefit and just installation of the FRR system, equates to 0.13% of SSB if the yellow eel EAV is applied.

vi. Local level effects

3.3.9 In response to concerns raised regarding the application of ICES stock units due to geographical scale, consideration has been given regarding the potential effects on a more localised scale. Full details of the assessment are presented in SPP103 (Ref.13) but are summarised here for ease of reference.

3.3.10 The assessment determined the predicted depletion of different fish species due to Sizewell C acting alone and in-combination with Sizewell B at the following scales (ranging from smallest to largest):

- The Greater Sizewell Bay and the tidal excursion.
- ICES Statistical Rectangle 33F1 containing Sizewell.
- ICES Statistical Area 4c (IVc), containing 33F1.

3.3.11 Local depletion was computed for 365 days and was based on predicted mortality of different species with the FRR system and LVSE intakes in place. The potential for impingement to cause localised depletion of pelagic, demersal and epi-benthic species was considered in the case of Sizewell B and Sizewell C individually and in-combination at the scale of the Greater Sizewell Bay, tidal excursion, ICES Statistical Rectangle 33F1 and Statistical Area 4c. A summary of results is presented in **Table 3.6**.

Table 3.6: Summary of modelling output relating to local scale effects (assumes mitigation in place and tidal exchange rate set at 10%) for species considered important for the WFD TFCI in the Alde and Ore

Species	Group	Period most abundant	Predicted % depletion due to combined station effects (Sizewell B and C)		
			Greater Sizewell Bay and tidal excursion	33F1	4c
Herring	Pelagic	Dec - March	1.51	0.07	0.013
Seabass	Demersal	Dec- March	2.37	0.105	0.020
Dover Sole	Epi-benthic	March - Oct	0.88	0.047	0.016
Thin-lipped grey mullet	Demersal	Jan - March	2.37	0.099	0.014
Smelt	Pelagic	April- Nov	1.52	0.08	0.029
Twaite shad	Pelagic	March - Aug	1.51	0.07	0.20

3.3.12 If smelt is taken as an example, even in the conservative case of 5% daily replenishment, the localised reduction is predicted to be 3.1% (1.5% for 10% daily replenishment, cf. **Table 3.6**). Combined with the sensitivity analysis undertaken on the effect smelt has on the TFCI (**Section 3.3b)iv**), these levels are unlikely to impact the index to such an extent that a deterioration would be expected. Additionally, the processes of mixing and fish behaviour would reduce depletion further from the intakes (as indicated by the three geographical scales listed in **Table 3.6**) therefore, given the mouth of the Alde-Ore Estuary is 25km to the south of Sizewell C, levels of depletion would be expected to be lower further reducing the risk of alteration to the TFCI and therefore fish classification.

vii. Changes to WFD water body classification since the original **WFD Compliance Assessment**

3.3.13 The 2019 classifications show the water body transitional fish status at 'Moderate' in 2019 (Ref.3), which indicates a deterioration from 'Good' in 2016. However, recalculation of the EQR using various methodologies indicates that the change is likely to be due to sample technique and data analysis method rather than an actual alteration in fish populations (Ref.14).

viii. Implications of revised entrapment assessment on discharge of pollution matter via the FRR system

3.3.14 Full details of this assessment are provided in TR520 (Ref.15). The assessment therein demonstrated that approximately 88% would sink immediately and be deposited in the area around the FRR outfall.

3.3.15 This effect was considered in the original **Section 2.5r)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]. However, given the changes to the impingement predictions, this assessment has been revised (using the same methodology) and the results on water quality parameters are summarised in **Table 3.7**.

Table 3.7: Summary of FRR system discharges on water quality, based on revised impingement data

Parameter contributing to WFD compliance	Results
Dissolved inorganic nitrogen (DIN)	All operational discharges would result in a very small elevation in DIN in the receiving water body representing <0.3% of the mass present in daily tidal exchange for Sizewell Bay. 26% of this is predicted to be from the FRR system. Very small contribution to overall nutrient concentrations which would not lead to a deterioration in the WFD water body.
Dissolved inorganic phosphorus (DIP)	All operational discharges would result in a very small elevation in DIP in the receiving water body representing 0.11% of the mass present in the daily tidal exchange for Sizewell Bay. 73% of this from the FRR system. Very small contribution to overall nutrient concentrations.
Biochemical oxygen demand (BOD)	Predicted oxygen demand of the decaying biomass (based on a 95th percentile) was estimated for Quarter 1 (maximum predicted impinged biomass and takes account of the influence of a temperature elevation of 2°C in the vicinity of the FRR). Area of 0.08 km^2 is predicted to move from good to moderate status for dissolved oxygen concentration. This represents 0.05% of the WFD water body area. This is a worst-case assessment as it assumes no predation and no remobilisation of partially decayed fish. In practice both effects will take place reducing the predicted area of influence on dissolved oxygen levels.
Unionised ammonia	Assessed for conditions that would maximise the derived concentration (i.e. 95th percentile biomass during Quarter 1 when the largest numbers of fish are impinged). Taking account of thermal influence and the most extreme background pH and salinity, an area of 0.00007 km^2 could be exposed to an un-ionised ammonia concentration at or above the EQS of 21mg l^{-1}. This equates to an area of 0.0005% of the WFD water body. Additionally, this input would be expected to dissipate more widely and have minimal influence on the water column or sediments.
Organic carbon	During the winter the highest numbers of fish are discharged from the FRR and adopting the peak value of associated carbon for the

Parameter contributing to WFD compliance	Results
	equivalent moribund biomass of fish this would contribute to an organic carbon loading at the benchmark standard level over an area of 1.5km^2 in the worst-case period for largest numbers of fish not surviving impingement (based on 95th percentile biomass in Quarter 1). This represents 1.03% of the WFD water body.

Phytoplankton

3.3.16 For much of the year, light availability limits phytoplankton growth and the addition of relatively small quantities of nutrients would have no effect. In the summer, nitrate is a limiting nutrient (when light is not limiting) and is consumed rapidly. However, the nutrient exchange with the wider marine environment is much greater than the maximum discharged by the station, during either operation or construction, such that the predicted increase in phytoplankton growth due to the Sizewell C discharges would be negligible. As a result, a deterioration in the WFD water body is not predicted.

Habitats

3.3.17 The influence of the FRR discharge does not occur within 500m of the WFD higher sensitivity habitat 'polychaete reef' present within the WFD water body. The FRR discharge would, however, overlap with the lower sensitivity 'infralittoral fine sand habitat' however the area over which unionised ammonia EQS would be exceeded represents a very small percentage of the WFD water body.

3.3.18 For assessment of the influence of the maximum biomass discharge decay upon DO, together with the influence of a temperature uplift from the thermal effluent, the area equivalent to a reduction from 'Good' to 'Moderate' status represents less than 0.6% of the lower sensitivity habitat within the water body.

3.3.19 The organic carbon deposition has a larger footprint of potential area affected and this could overlap with an area of ca., 11% Infralittoral fine sand habitat within the Suffolk coastal water body. However, benthic invertebrate species associated with this habitat have a largely ubiquitous distribution across habitats in Sizewell Bay. Details of the core species found within this habitat type indicates that many are tolerant of smothering and deoxygenation and a substantial component of both infaunal and epifaunal communities would benefit from organic matter input (Ref.15). As a result, a deterioration in this habitat and its contribution to WFD compliance is not predicted.

Adjoining WFD water bodies

3.3.20 For adjacent WFD water bodies (Blyth and Alde-Ore), the discharge is located over 10km from the mouth of the Blyth and 23km from the mouth of the Alde-Ore estuary. Furthermore, the inshore estuaries and tidal areas of Eastern England, monitored for opportunistic macroalgal as part of the WFD, do not appear to exhibit excessive growth (Ref.16). As a result, discernible effects on opportunistic algae due to nutrient discharges are not predicted.

c) Summary of assessment

3.3.21 The additional assessments summarised in **Section 3.3b)** demonstrate that:

- The revised impingement calculations for all 24 species considered do not exceed the 1% threshold, and would therefore not result in within-class status deterioration in the Alde and Ore transitional water body.
- The revised entrapment calculations, which considered the updated impingement assessment, are similar to those obtained for impingement alone, with only sand goby exceeding the 1% threshold. However, this species is unexploited, short lived, ubiquitous and highly recoverable, and as such its entrapment would not result in deterioration of water body status.
- None of the scenarios considered in the TFCI sensitivity test, which forced the reduction or removal of key fish species, resulted in status deterioration in the Alde and Ore transitional water body. The proposed development would not therefore cause a deterioration in the fish classification of this water body.
- Further sensitivity testing demonstrated that changes to parameters such as LVSE efficiency, FRR mortality, EAV values and fish distribution did not cause the mean and upper impingement estimates for key species to breach the 1% threshold, with the exception of bass and European eel. However, mitigation in the form of the LVSE intakes and FRR system reduces these impacts below the threshold level.
- Discharge of pollutant matter from the FRR would not increase nutrient concentrations sufficiently to result in increased phytoplankton growth or adverse impacts on key species supported by infralittoral fine sand habitats in the Suffolk coastal water body. There would also be no impact on the connected Alde and Ore transitional water body.

3.3.22 The additional assessments summarised in this section therefore confirm that there is no change to the conclusions of **Part 2** of the **WFD**

Compliance Assessment (Doc Ref. 8.14) [APP-621], and that the proposed development would not result in deterioration in water body status.

3.4 Fen meadow compensatory habitat sites

a) Introduction and project description

3.4.1 Two sites identified for fen meadow compensatory sites were considered in **Section 2.3d)** of **Part 2** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-621]. However, the correct locations of these sites were not reflected in the assessment. As a consequence, the WFD water bodies that could potentially be impacted by the development of compensatory habitat need to be updated and the assessment revisited accordingly. This section therefore reassesses the proposed fen meadow compensatory areas.

i. Overview of proposals

3.4.2 The fen meadow compensation site proposals cover two sites, one located to the south west of the main development site (Benhall), and the other to the north west (Halesworth). The two locations are shown in **Figure 3.1**.

3.4.3 The fen meadow compensation areas will provide a total of approximately 16ha of fen meadow habitat to compensate for the permanent loss of fen meadow habitat from within Sizewell Marshes SSSI. They will provide new lowland fen meadow habitat, including modified landforms to raise water levels, where necessary, new minor watercourses and associated planting.

3.4.4 Works to create the fen meadow habitat would be similar to those described at Pakenham (**Section 2.5**), commencing at the outset of construction on the main development site, and would include the following measures:

- Installation of water control structures, to maintain / manipulate water levels.
- Removal of any existing field drains, to reverse historic patterns of drainage.
- Local excavation to reduce local ground levels, create low bunds and /or create minor surface watercourses to help distribute surface water and reduce nutrient levels.
- Translocations of some turfs from the fen meadow areas of the Sizewell Marshes SSSI that would otherwise be lost through construction works.

- Limited planting of other locally sourced native species and use of appropriately sourced 'green hay' from Sizewell Marshes SSSI to accelerate colonisation by key fen meadow species.

b) Activity and water body identification

3.4.5 **Figure 3.1** shows the WFD water bodies that could be hydrologically connected to the two proposed sites. A screening exercise has been undertaken to identify which of the water bodies have the potential to be impacted by the two habitat creation schemes, with water bodies being identified on the basis of hydrological connectivity to the proposed development sites following the methodology presented in **Part 1**.

3.4.6 In addition to WFD water body mapping, potential hydrological connectivity has been determined with reference to main rivers, ordinary watercourses and surface water flow routes that may not be shown on published mapping (identified using Environment Agency flood mapping). This process therefore considers the water bodies in whose catchments the proposed activities are located, and where relevant, connected water bodies upstream and downstream.

3.4.7 The assessment presented in the subsequent sections is based on the latest water body classification data, which was published by the Environment Agency in September 2020 (Ref.3).

3.4.8 The Benhall site is located within the Fromus (GB105035045980) river water body catchment (**Figure 3.1**). The Fromus, which is not designated as heavily modified or artificial, is currently at Poor Ecological Status due to pressures on fish, invertebrates, dissolved oxygen and phosphate. The water body also fails chemical status in relation to PBDEs and mercury and its compounds (Ref.3). The Fromus drains into the Alde – Ore (d/s confluence) (GB105035045950) river water body approximately 3.3km downstream of the proposed fen meadow creation site. The Alde – Ore is currently at Poor Ecological Status due to pressures on fish, dissolved oxygen and phosphate. The water body also fails chemical status due to elevated concentrations of PBDEs and mercury and its compounds (Ref.3).

3.4.9 The Halesworth site is located within the Blyth (Hevingham Hall - d/s Halesworth) (GB105035046030) river water body catchment (**Figure 3.1**). The water body is designated as heavily modified, and is currently at Good Ecological Potential but fails chemical status due to elevated concentrations of PBDEs and mercury and its compounds (Ref.3). The Halesworth site is situated approximately 0.6km upstream of the Blyth (d/s Halesworth) (GB105035046290) river water body. This water body is also heavily modified, and is at Moderate Ecological Potential due to low dissolved oxygen, high concentrations of phosphates and pressures on

fish. The water body also fails chemical status due to elevated concentrations of PBDEs, PFOS and mercury and its compounds (Ref.3).

3.4.10 Both sites are underlain by the Waveney and East Suffolk Chalk and Crag (GB40501G400600) groundwater body (**Figure 3.1**). This is currently at Poor Quantitative Status as a result of an unfavourable water balance and Poor Chemical Status due to diffuse pollution pressures and potential impacts on a Drinking Water Protected Area (Ref.3).

3.4.11 Potential impacts on these water bodies are considered in the subsequent sections. No other water bodies were considered due to the lack of hydrological connectivity with the proposed habitat creation sites.

c) Potential impacts on water body status

i. Impacts on the Fromus and Blyth (Hevinham Hall – d/s Halesworth) river water body catchments during construction and operation

3.4.12 There is opportunity for the proposal to deliver significant beneficial effects to the surface water environment. However, there are risks of adverse impacts on the Fromus and Blyth (Hevingham Hall – d/s Halesworth) water bodies through changes in land drainage and morphological processes during the creation of the fen meadow habitat. Stripping of topsoil, vegetation clearance, stockpiling, earthworks and associated machine movements could potentially result in the supply of fine sediment and contaminants such as oils and fuel from construction plant into the surface drainage network during the construction phase.

3.4.13 However, the control measures embedded in the **Code of Construction Practice** (Doc Ref. 8.11) [APP-615] would ensure that site drainage is controlled and that there are no untreated discharges to water. This will ensure that there would be no deterioration in physico-chemistry or chemistry as a result of construction activities. Physical effects, including erosion and sediment transport associated with earthworks are anticipated to be minimal, and no impacts on the hydromorphology of surface waters are expected during construction.

3.4.14 There is potential for long-term impacts on the conveyance of flows through the surface drainage network within the floodplain following completion of the fen meadow and the installation of new control structures in the floodplain drainage network. The local effect would be to reduce the overall effectiveness of drainage within the site, thereby retaining more water within floodplain wetland habitats. However, it is anticipated that the design will complement the existing floodplain and river channel habitats. Any changes are unlikely to result in significant changes to the hydrological regime at water body scale and are therefore considered to be beneficial,

locally contributing to improved floodplain connectivity and slowing hydrological response times.

3.4.15 Any changes to hydromorphology or physico-chemistry are therefore likely to be limited and as such there is unlikely to be any deterioration in the status of the biological quality elements during construction or operation. Indeed, it is possible that the status of the biological quality elements (e.g. invertebrates) could improve as a result of the creation of new habitats adjacent to the watercourse. Furthermore, the creation of new wetland habitats could create a new phosphorus sink in the catchment, thereby contributing towards a reduction in phosphate concentrations and, potentially, an improvement in physico-chemical status.

3.4.16 Based on the assessment presented above, the potential effects of the construction and operation of fen meadow habitat creation on the Fromus and Blyth (Hevingham Hall – d/s Halesworth) water bodies are not predicted to be sufficient to result in deterioration in the status of any hydromorphological, physico-chemical or biological quality elements.

ii. Impacts on connected water bodies

3.4.17 As a result of the limited scope and spatial extent of any impacts on the hydromorphology, physico-chemistry and biology on the Fromus and Blyth (Hevingham Hall - d/s Halesworth) water bodies, there are not predicted to be any changes in the quality elements supported by the downstream water bodies (the Alde – Ore (d/s confluence) and Blyth (d/s Halesworth), respectively).

3.4.18 Furthermore, the proposed fen meadow habitat creation is not expected to result in a reduction in the interaction between surface and groundwater, or introduce a new source of contaminants into the Waveney and East Suffolk Chalk and Crag groundwater body. Moreover, the creation of a new wetland could potentially contribute favourably to a reduction in phosphate concentrations and an improvement in groundwater-dependent terrestrial ecosystems in the catchment, and as such could contribute towards an improvement in the status of the groundwater body.

d) Potential impacts on RBMP mitigation measures

3.4.19 The RBMP does not identify any improvement measures for the River Fromus. However, the RBMP highlights a range of mitigation measures for the heavily modified Blyth (Hevingham Hall - d/s Halesworth) river water body, which are largely focussed on reducing the impacts of sediment and vegetation management and reducing the impacts associated with invasive species (Ref.3).

3.4.20 The proposed creation of fen meadow habitat is designed to be an environmental enhancement. Furthermore, the measures set out in the **Code of Construction Practice** (Doc Ref. 8.11) [APP-615] would prevent the introduction or spread of invasive species as a result of construction activities. It is therefore considered unlikely that it would counteract or prevent the future implementation of any of the mitigation measures identified for the water body in the RBMP.

e) Potential impacts on Protected Areas

3.4.21 There are several Nitrate Vulnerable Zones (NVZs) associated with the water bodies in which the proposed fen meadow creation would take place:

- Fromus: the Alde NZV (S411), the Fromus NVZ (S412) and the Leiston Beck and Minsmere Old River NVZ (S415) (Ref.3).
- Blyth (Hevingham Hall - d/s Halesworth): the Blyth NVZ (S417) and the Leiston Beck and Minsmere Old River NVZ (S415) (Ref.3).

3.4.22 However, no increase to nitrate use is proposed as a result of the construction or operation of the fen meadow habitat creation, and any reversion from arable land to fen habitats could decrease the use and runoff of nitrates from any parts of the site used for productive agriculture. No impacts on the NVZ are therefore expected. There are no further Protected Areas associated with either water body.

f) Summary of impacts

3.4.23 The previous sections demonstrate that the proposed fen meadow habitat creation would not result in deterioration in the status of the hydromorphology, physico-chemistry, biology or chemistry of the Blyth (Hevingham Hall - d/s Halesworth) water body or the Fromus water body (within or between status classes). Furthermore, the proposals would not prevent the implementation or counteract the effects of mitigation measures identified in the RBMP, or adversely affect Protected Areas linked to the water bodies. This means that the proposed design change would not result in deterioration in the status of these river water body or prevent WFD objectives being achieved in the future.

3.4.24 Because impacts are not considered to be sufficient to result in deterioration in water body status, it can also be concluded that the proposed activities will not impact upon the status of the downstream river water bodies (Alde – Ore (d/s confluence) and Blyth (d/s Halesworth)) or underlying groundwater body (Waveney and East Suffolk Chalk and Crag).

3.5 Water Supply Strategy update

a) Description of strategy

3.5.1 As set out in the **Water Supply Strategy Update** at **Volume 3, Appendix 2.2.D** of the **ES Addendum**, construction of the Sizewell C Project continues to entail many activities that would require water supply, both potable and non-potable. SZC Co. has continued to develop its water supply strategy by engaging with stakeholders including the Environment Agency, Essex & Suffolk Water and Anglian Water.

3.5.2 SZC Co. has updated its estimated water supply requirements during construction, based on a more detailed understanding of construction requirements and further findings from Hinkley Point C (HPC).

3.5.3 During the early years water demand continues to peak around 1.5Ml/d. During the main construction phase, potable water demand is predicted to peak at 3Ml/d during tunnelling works, before returning to up to around 2Ml/d. This assumes no recycling of water by the tunnel boring machines, which would reduce demand. After the completion of the tunnelling, forecast demand falls below 1Ml/d and then gradually decreases through the remainder of the construction period to around 0.5Ml/d. The demand during operation continues to be expected to be significantly lower than during construction. Further detail is set out in **Appendix 2.2D** of the **ES Addendum**.

3.5.4 The following water supply options have been retained.

Sizewell B effluent reuse

3.5.5 The Sizewell B foul water treatment plant provides a potentially viable option to supply treated water to the construction site for reuse, rather than discharge to sea under an existing discharge permit. This would result in less water being discharged to sea.

Licence trading with local abstractors

3.5.6 Licence trading with local abstractors also forms part of the potential water supply strategy. SZC Co. would broker a licence trade between local abstractors and Essex & Suffolk Water to enable Essex & Suffolk Water to increase volumes they can abstract from existing groundwater sources. Alternatively, SZC Co. may take on a licence from nearby abstractors via a trade directly, where practicable. The abstractions would be within current abstraction licence limits, where there is spare resource within previously abstracted levels. Therefore, there would be no new, or additional volumes extracted than that already permitted.

Flood water storage

3.5.7 This option has been taken forward in the form of the water resource storage area. The Application identifies that a temporary non-potable water storage area would be constructed for use in the construction process to the north of the main development site providing a storage area of approximately 16,000m^3 (**Change 5**).

Local demand management options

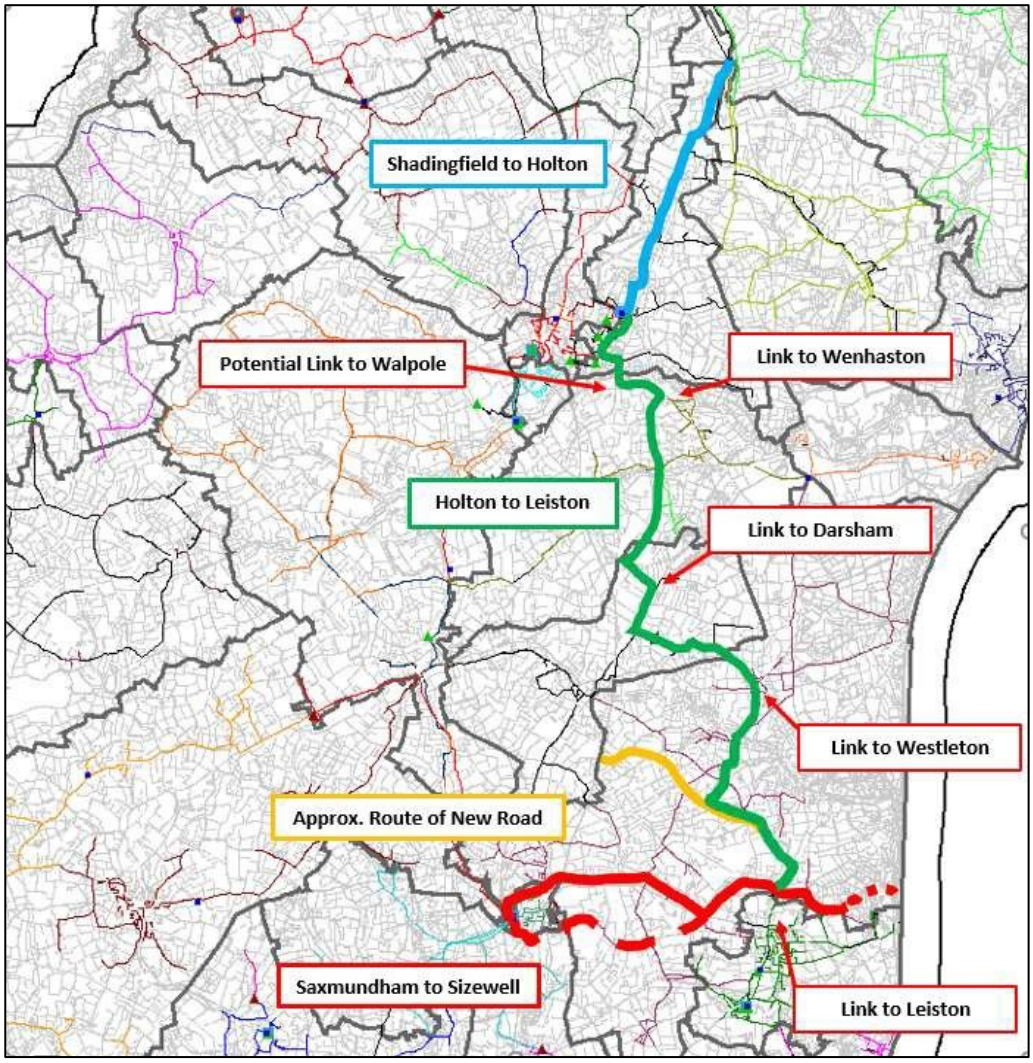
3.5.8 There are a range of local demand options which have been proposed and retained. These include re-using water on site, treating as necessary, or minimising water usage.

Essex & Suffolk Water transfer from Northern/Central Water Resource Zone

3.5.9 The principal supply for the Sizewell C Project is unchanged from the original **Site Water Supply Strategy** (Doc Ref. 8.4) [APP-601] and is assumed to come from mains water transferred via a new pipeline transfer connection from the Northern/Central Water Resource Zone. This scheme would be provided by Essex and Suffolk Water and does not form part of the Application.

3.5.10 The scheme proposed would provide a direct link from Barsham to Sizewell (**Plate 3.1**: Pipeline transfer connection to Sizewell C).

Plate 3.1: Pipeline transfer connection to Sizewell C



b) Potential for cumulative effects resulting from the water transfer option

i. Potentially affected water bodies

3.5.11 As described in **section 3.5a)**, the transfer of water from Essex & Suffolk Water's Northern/Central Water Resource Zone is likely to require the installation of new pipeline infrastructure. There is therefore potential for cumulative impacts to occur in water bodies where the new water supply infrastructure overlaps with the proposed Sizewell C Project.

3.5.12 As summarised in **Part 4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-623], the proposed Sizewell C Project (including the main development site and associated development sites) could potentially affect

the following water bodies, which could also be affected by the installation of the proposed water supply infrastructure:

- Leiston Beck (GB105035046271);
- Minsmere Old River (GB105035046270);
- Hundred River (GB105035046260);
- Wenhaston Watercourse (GB105035046010);
- Fromus (GB105035045980); and
- Waveney and East Suffolk Chalk & Crag (GB40501G400600).

ii. Potential cumulative effects

3.5.13 It is anticipated that the proposals to install the water supply infrastructure could involve minor earthworks in the catchments of the water bodies listed above during installation of the proposed pipeline route. This could potentially result in an increase in the supply of fine sediment and the supply of contaminants (e.g. fuel, lubricants and construction materials) from construction equipment to receiving surface waters. However, the best practice measures to prevent the supply of contaminants and fine sediment during construction set out in the **Code of Construction Practice** (Doc Ref. 8.11) [APP-615] would prevent the input of fine sediment and contaminants into the watercourse, and prevent any changes to physico-chemistry and hydromorphology. Furthermore, the same measures would also prevent groundwater contamination and thus prevent deterioration in the chemical status of the underlying groundwater.

3.5.14 In addition, the same river water bodies (or their tributaries) could potentially be crossed by the proposed transmission pipeline. The installation of water supply infrastructure across watercourses could potentially impact upon the morphological conditions and hydrological regime of affected water bodies, particularly if any new pipelines are installed using open trenched techniques. However, appropriate construction techniques (e.g. temporary damming and diversion prior to bed and bank reinstatement, or trenchless crossing techniques for larger and/or more sensitive watercourses) would minimise construction-stage impacts, which are considered to be temporary in duration and spatially limited to the construction footprint. Furthermore, once installed, the pipelines would be located below the bed of the channel and as such would not impact upon the watercourse during operation. It is therefore considered that there would be no deterioration in the status of these water bodies as a result of the construction of the new water supply.

3.5.15 The small scale nature of the effects and anticipated mitigation measures described above indicate that any effects on these water bodies resulting from the proposed water supply measures are likely to be very minor and limited both spatially and temporally. This indicates that cumulative effects with the potential impacts discussed in **Part 4** of the **WFD Compliance Assessment** (Doc Ref. 8.14) [APP-623] are unlikely to occur. There are therefore no risks of cumulative effects associated with works to provide a water supply to the Sizewell C Project.

iii. Potential impacts on RBMP mitigation or improvement measures

3.5.16 The implications of the installation of water supply infrastructure required to meet the demand for Sizewell C construction and operation are considered to be minimal. It is therefore considered unlikely that it would counteract or prevent the future implementation of any of the mitigation or improvement measures identified for the water bodies identified in the RBMP.

iv. Potential impacts on Protected Areas

3.5.17 The implications of the installation of water supply infrastructure required to meet the demand for Sizewell C construction and operation are considered to be minimal. It is therefore considered unlikely that it would adversely affect any Protected Areas associated with the water bodies along the proposed pipeline route.

c) Potential for cumulative effects resulting from other water supply options

3.5.18 As described in **section 3.5a)**, there are several alternative options for providing water supply to the Sizewell C Project: reuse of effluent from Sizewell B, licence trading with local abstractors, flood water storage, and local demand management options.

3.5.19 The flood water storage option was identified in the Application, and changes to the location of the site have been assessed in **Section 2.2**. These assessments concluded that there would be no adverse impacts resulting from these proposals, and as such there is no potential for cumulative effects to occur.

3.5.20 The remaining options would rely on changes to the management of existing water resources and are unlikely to require new infrastructure. There is therefore no potential for cumulative effects to arise with the proposed Sizewell C Project.

d) Summary of potential cumulative effects

3.5.21 The previous sections demonstrate that the proposed new water supply options for Sizewell C would not result in deterioration in the status of the hydromorphology, physico-chemistry, biology or chemistry of the Wenhaston Watercourse, Minsmere Old River, Fromus, Hundred River, and Leiston Beck water bodies, or in the quantity or chemistry of the Waveney and East Suffolk Chalk & Crag groundwater body.

3.5.22 Furthermore, the proposals would not prevent the implementation or counteract the effects of mitigation measures identified in the RBMP, or adversely affect Protected Areas linked to the water bodies. This means that the proposed water supply options would not result in deterioration in the status of these river water bodies or prevent WFD objectives being achieved in the future.

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