Hampshire Water Recycling & Water Transfer Project

EIA Scoping Report – Volume II Appendices

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1.1 Introduction

1.1.1 The Proposed Development relates to the administrative areas of both upper and lower tier local authorities, and a National Park Authority.

1.1.2 Local planning policies can be important and relevant to the decision on the application for the Proposed Development as they contain information about local designation and allocations, provide an understanding of local issues, and help to define the scope of appropriate mitigation.

1.1.3 This appendix provides an overview of the relevant local authorities whose areas the Proposed Development would be located in and associated statutory development plans. The level of weight to be attached to adopted statutory development plan policies will be guided by whether they represent up to date policies.

1.1.4 As weight can be given to policies in emerging plans guided by their stage of preparation, the extent of outstanding objections to relevant policies and the degree of consistency to the National Planning Policy Framework (NPPF) [1], this appendix also outlines the relevant emerging plans below.

1.2 East Hampshire District Council

1.2.1 The Proposed Development would connect to the Havant Thicket Reservoir (ref. APP/20/00990 in relation to land within the administrative boundary of Havant Borough Council (HBC) and Ref: 51680/001 for the section within East Hampshire District Council (EHDC)).

1.2.2 EHDC is a lower-tier district council. The statutory development plan for EHDC is made up of the documents mentioned in Table 2-1 within Volume I.

1.2.3 Policy CP26 Water Resources/Water Quality in the East Hampshire District Local Plan: Joint Core Strategy (2014) [2] safeguards the site identified for the Havant Thicket Reservoir and sets out the duty of EHDC to take account of the Water Framework Directive (WFD) objectives.

1.2.4 There is an emerging Local Plan which will replace the Joint Core Strategy [2], Housing and Employment Allocations (2016) [4] and the Local Plan Second Review (2006) [5]. EHDC consulted on the Draft Local Plan 2017-2036 in 2019 [6]. Consultation on the draft Local Plan in accordance with Regulation 19 of the Town and Country Planning (Local Planning) (England) Regulations 2012 (Regulation 19) is due to take place in 2024.

1.3 Eastleigh Borough Council

1.3.1 The Proposed Development would intersect areas designated as Sites of Importance for Nature Conservation (SINC) within the Eastleigh Borough Council (EBC).

1.3.2 EBC is a lower-tier district council. The statutory development plan for EBC is made up of the documents mentioned in Table 2-1 within Volume I.

1.3.3 Policy DM11 [6] Nature Conservation requires development proposals that have a direct or indirect adverse effect on a SINC to demonstrate the following:

- *"a. there are no alternative solutions;*
- *b. the adverse effects are unavoidable;*
- *c. measures are taken to mitigate or, as a last resort, compensate for the adverse effects;*
- *d. there is an overall biodiversity net gain; and*
- *e. if there are any residual adverse effects which cannot be avoided, mitigated or compensated, the benefits of the development must clearly outweigh the adverse effects on the nature conservation value of the site and any broader impacts on national and local designations."*

1.4 Fareham Borough Council

1.4.1 Part of the Proposed Development intersects an area of special landscape quality within the Fareham Borough Council (FBC).

1.4.2 FBC is a lower-tier district council. The statutory development plan for FBC is made up of the documents mentioned in Table 2-1 within Volume I.

1.4.3 Policy DS3 Landscape protects areas of special landscape quality identified on the policies map [7]. Proposals for major development must be accompanied by a comprehensive landscape mitigation and enhancement scheme.

1.4.4 Policies NE1 Protection of Nature Conservation, Biodiversity and the Local Ecological Network and NE9 Green Infrastructure protect the natural environment, habitats, species, designated sites and green infrastructure [8].

1.4.5 Policy DS1 Development in the Countryside protects the countryside or land outside the defined settlements from development that would have an adverse impact on its landscape character, appearance and function. Provision of infrastructure meeting an overriding public need is an acceptable form of built development on such land [8].

1.5 Hampshire County Council

1.5.1 Hampshire County Council (HCC) as an upper-tier county council is the local highway authority, the Lead Local Flood Authority and the local authority for minerals and waste in Hampshire.

1.5.2 HCC adopted the Hampshire Minerals and Waste Plan (HMWP) [9] in 2013. The HMWP sets out the vision, objectives, spatial strategy and policies for "*safeguarding of mineral resources, mineral infrastructure, waste infrastructure and potential minerals and waste wharf or rail depot infrastructure*" in Hampshire up to 2030.

1.6 Havant Borough Council

1.6.1 The following components forming part of the Proposed Development are located in HBC:

- The proposed Water Recycling Plant (WRP)
- The proposed High Lift Pumping Station (HLPS)
- The Proposed Underground Pipeline between the Budds Farm Wastewater Treatment Works (WTW) and the proposed WRP and
- The start of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne Water Supply Works (WSW)

1.6.2 The Proposed Development also covers areas designated as SINCs and allocated as employment site within HBC.

1.6.3 HBC is a lower-tier district council. The statutory development plan for HBC is made up of the documents mentioned in Table 2-1 within Volume I.

1.6.4 Part of the Proposed Development covers an area allocated as BD11 Brockhampton West [10] which is described as "*a large 'gateway' employment site*". Policy CS2 Employment [11] sets out the employment floorspace requirements (former B Class uses) for HBC.

1.6.5 Policy CS11 Protecting and Enhancing the Special Environment and Heritage of Havant Borough [11] requires development proposals to have particular regard to the hierarchy of nature conservation designations in the HBC, including SINCs.

1.6.6 Policy CS19 Effective Provision of Infrastructure [11] safeguards the requirements of infrastructure providers including the Budds Farm WTW and Havant Thicket Reservoir.

1.6.7 HBC submitted the Havant Borough Local Plan for examination in 2021, which was subsequently withdrawn in March 2022 following the Inspector's recommendation to undertake additional work and consultation prior to resubmitting for examination. A Regulation 18 consultation took place in late 2022 on a revised new local plan. The local plan is forecasted to be adopted in 2025.

1.7 Portsmouth City Council

1.7.1 Part of the Proposed Development lies within the northern administrative boundary of Portsmouth City Council (PCC). PCC is a unitary authority. The development plan for PCC comprises:

- Portsmouth Plan (The Portsmouth Core Strategy) (2012) [12]
- A number of saved policies from the Portsmouth City Local Plan (2006) [13]
- Southsea Town Centre Area Action Plan (2007) [14]
- Somerstown and North Southsea Area Action Plan (2012) [15]
- Milton Neighbourhood Plan (adopted July 2022) [16]

1.7.2 PCC are in the process of preparing a new Local Plan [18]. Consultation in accordance with Regulation 18 took take place in autumn 2021.

1.8 Winchester City Council

1.8.1 The Proposed Development is partly located in and adjacent to areas designated as priority habitats, including Ancient Woodland, Sites of Special Scientific Interest (SSSI) and SINC.

1.8.2 Winchester City Council (WCC) is a lower-tier district council. The statutory development plan for WCC is made up of the documents mentioned in Table 2-1 within Volume I.

1.8.3 Policy CP16 Biodiversity [19] requires development proposals that have the potential to impact on priority habitats and/or species to take account of relevant evidence and assessments or surveys.

1.8.4 WCC has commenced the preparation of a new Local Plan [20] to accommodate growth needed for the district, outside of the South Downs National Park (SDNP). The Regulation 18 consultation took place in late 2022 with the Regulation 19 consultation planned for August 2023.

1.9 South Downs National Park Authority

1.9.1 An area of the Proposed Development may intersect the SDNP. The Proposed Development is also in proximity of a landscape character area identified within the National Park.

1.9.2 South Downs National Park Authority (SDNPA) is the LPA for the SDNP. The statutory development plan for SDNPA is made up of the documents mentioned in Table 2-1 within Volume I.

1.9.3 Policy SD3 Major Development [21] indicates that a proposal for major development in the SDNP, including infrastructure and associated works, will only be permitted in exceptional circumstances and where it is demonstrably in the public interest. Such proposal is required to be supported by an assessment of the following:

- *"a) The need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy;*
- *b) The cost of, and scope for, developing elsewhere outside the designated area, or meeting the need for it in some other way; and*
- *c) Any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated."*

1.9.4 If the development is considered acceptable, Policy SD3 expects the proposal to harness all opportunities to conserve and enhance the special qualities of the National Park.

1.9.5 The South Downs Local Plan [21] identifies landscape character types for which Policies SD4 Landscape Character, SD5 Landscape-led Approach to Design, SD6 Safeguarding Views, SD7 Relative Tranquillity and SD8 Dark Night Skies are of relevance. Development proposals are required to conserve and enhance landscape character, relative tranquillity and dark night skies. Policy also requires

design that is sensitive to local character as well as preservation of the visual integrity, identity and scenic quality of the National Park.

1.9.6 Policy SD42 Infrastructure [21] requires proposals for new infrastructure to be the least environmentally harmful option reasonably available, taking account of relevant operational requirements and technical limitations.

1.9.7 SDNPA is the local authority for minerals and waste for their administrative area, and share the same minerals and waste plan [17] with HCC as outlined above.

1.10 Other considerations and guidance

1.10.1 The following policy and guidance documents are other considerations of relevance:

Local policy and guidance:

- Hampshire Local Flood and Water Management Strategy (2020) [22]
- Hampshire County Council Climate Change Strategy (2020-2025) [23]
- Hampshire County Council technical guidance notes (2022)
- Hampshire Local Transport Plan 2011-2031 [24] and draft Local Transport Plan 4 [25]
- Hampshire County Council Local Cycling and Walking Infrastructure Plan (November 2022)
- Hampshire County Council Walking Strategy (2016) [26]
- East Hampshire District Climate Change and Sustainable Construction Supplementary Planning Document (SPD) (2022) [27]
- Fareham Open Space Supplementary Planning Guidance (SPG) (2002) [28]
- Fareham Borough Landscape Assessment (2017) [29]
- Fareham Borough Design Guidance SPG (Excluding Welborne) (2015) [30]
- Havant Borough Council Borough Design Guide SPD (2011) [31]
- Portsmouth Air Quality and Air Pollution SPD (2006) [32]
- Portsmouth Achieving Employment and Skills Plans SPD (2013) [33]
- Portsmouth Parking Standards and Transport Assessment SPD (2014) [34]
- Portsmouth Sustainable Design and Construction A Practical Guide for Developers (2013) [35]
- City of Winchester Movement Strategy (2019) [36]
- Winchester High Quality Places SPD (2015) [37]
- Winchester Landscape Character Assessment SPD (2022) [38]
- Winchester Air Quality SPD (2021) [39]
- South Downs National Park Sustainable Construction SPD (2020) [40]
- South Downs National Park Design Guide SPD (2022) [41]
- Eastleigh Biodiversity SPD (2009) [42]
- Eastleigh Character Area Appraisals SPD (2007) [43]

- Eastleigh Trees and Development SPD (2022) [44]
- Eastleigh Environmentally Sustainable Development SPD (2009) [45]
- Eastleigh Quality Places SPD (2011) [46]

Appendix 8-1 Internationally designated sites within 2km/hydrologically connected to the Scoping Area

Site Name	Designation	Distance from Scoping Area	Description
River Itchen	SAC	Within the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation for which this is considered to be one of the best areas in the United Kingdom. The site supports; Brook lamprey *Lampetra planeri* and Atlantic salmon *Salmo salar* for which the area is considered to support a significant presence; European bullhead *Cottus gobio* for which this is considered to be one of the best areas in the United Kingdom; Otter *Lutra lutra* for which the area is considered to support a significant presence; Southern damselfly *Coenagrion mercuriale* for which this is considered to be one of the best areas in the United Kingdom and white-clawed crayfish *Austropotamobius pallipes* of which the area is considered to support a significant presence.
Solent Maritime	SAC	Within the Proposed Underground Pipeline between Budds Farm WTW and the proposed WRP and within Eastney Long Sea Outfall (LSO).	The Solent encompasses a major estuarine system on the south coast of England with four coastal plain estuaries (Yar, Medina, King's Quay Shore, Hamble) and four bar-built estuaries (Newtown Harbour, Beaulieu, Langstone Harbour, Chichester Harbour). Solent Maritime is the only site for smooth cordgrass Spartina alterniflora in the UK and is one of only two sites where significant amounts of small cord-grass S. maritima are found. The Solent contains the second-largest aggregation of Atlantic salt meadows in south and south-west England. Qualifying habitats: The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I: Annual vegetation of drift lines Atlantic salt meadows (Glauco-Puccinellietalia maritimae) Coastal lagoons Spartina swards (Spartinion maritimae). (Cord-grass swards) Mudflats and sandflats not covered by seawater at low tide. (Intertidal mudflats and sandflats)

Site Name	Designation	Distance from Scoping Area	Description
			Perennial vegetation- of stony banks. (Coastal shingle vegetation outside the reach of waves) Salicornia and other annuals colonising mud and sand (Glasswort and other annuals colonising mud and sand) Sandbanks which are slightly covered by sea water all the time. (Subtidal sandbanks) Shifting dunes along the shoreline with Ammophila arenaria (white dunes). (Shifting dunes with marram). The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following species listed in Annex II: Desmoulin's whorl snail Vertigo moulinsiana
Solent and Isle of Wight Lagoons	SAC	Hydrologically connected to the proposed WRP.	The site includes a number of lagoons in the marshes in the Keyhaven – Pennington area, at Farlington Marshes in Chichester Harbour, behind the sea-wall at Bembridge Harbour and at Gilkicker, near Gosport. The lagoons show a range of salinities and substrates, ranging from soft mud to muddy sand with a high proportion of shingle, which support a diverse fauna including large populations of three notable species: the nationally rare foxtail stonewort *Lamprothamnium papulosum*, the nationally scarce lagoon sand shrimp *Gammarus insensibilis* and the nationally scarce starlet sea anemone *Nematostella vectensis*.
South Wight Maritime	SAC	Hydrologically connected to the Eastney LSO.	The Solent encompasses a major estuarine system on the south coast of England with four coastal plain estuaries (Yar, Medina, King's Quay Shore, Hamble) and four bar-built estuaries (Newtown Harbour, Beaulieu, Langstone Harbour, Chichester Harbour). The site is the only one in the series to contain more than one physiographic sub-type of estuary and is the only cluster site. The Solent and its inlets are unique in Britain and Europe for their hydrographic regime of four tides each day, and for the complexity of the marine and estuarine habitats present within the area.
Chichester and Langstone Harbour	SPA	Within the Proposed Underground Pipeline between Budds Farm WTW	An internationally important site for regularly supporting 10,000 wintering wildfowl and more than 20,000 wintering waders. The site also supports internationally important numbers of: Grey plover *Pluvalus sqatarola*: 3.9% of the western European population Sanderling *Caldris alba*: 3.1%

Site Name	Designation	Distance from Scoping Area	Description
		and the proposed WRP.	Dunlin *Caldris alpina* 2.6% of the north-west European and western African population Redshank *Tringa totanus*: 1.4% of the eastern Atlantic population Brent goose *Branta bernicla*: 12% of the western European population Shelduck *Tadorna tadorna*: 3.3% of the UK population Teal *Anas crecca*: 1% of the north-west Europe population
Portsmouth Harbour	SPA	1.6km south of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Portsmouth Harbour qualifies under Article 4.2 of the Birds Directive by supporting internationally or nationally important wintering populations of the following species of migratory waterfowl (average peak counts for the five-year period 1986/87 to 1990/91): 2,290 dark-bellied brent geese Branta bernicla bernicla (1.3% of the north-western Europe population and 2.5% of the British wintering population) 100 red-breasted merganser Mergus serrator (1% of the UK population) 70 black-tailed godwit Limosa limosa (over 1% of the UK population) 1,010 dunlin (over 1% of the UK population)
Solent and Dorset Coast	SPA	1.6 km south of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	The Solent and Dorset Coast SPA is located along the coasts of Dorset and the varied habitats include saltmarsh, wet meadows, drier grassland, heath, sand dune, woodland and scrub and the site is of great ornithological interest. The SPA is designated for populations of Annex 1 species of the Bird Directive including: Sandwich tern Common tern Little tern
Solent and Southampton Water	SPA	Hydrologically connected to the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Solent and Southampton Water SPA is designated for its waterbird assemblage and populations of Annex 1 species of the Bird Directive: Mediterranean Gull Larus melanocephalus Sandwich tern Sterna sandvicensis Common tern Sterna hirundo Little tern Sterna albifrons Roseate tern Sterna dougalli Non-annex 1 migratory species:

Site Name	Designation	Distance from Scoping Area	Description
			Dark-bellied brent geese Teal Black-tailed godwit Ringed plover Charadrius hiaticula
Chichester and Langstone Harbour	Ramsar	Within the Proposed Underground Pipeline between Budds Farm WTW and the proposed WRP.	Chichester and Langstone Harbours are large, sheltered estuarine basins comprising extensive mud and sand flats exposed at low tide. The site is of particular significance for 20,000 over-wintering wildfowl and waders and a wide range of coastal and transitional habitats supporting plant and animal communities.
Portsmouth Harbour	Ramsar	1.6km south of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Portsmouth harbour is a large, industrialised estuary consisting of a saltmarsh, vast expanses of mudflats, and tidal creeks on the south coast. The mudflats, supporting extensive beds of eelgrass, green algae and sea lettuce *Ulva lactuca*, providing feeding grounds for internationally important numbers of wintering dark-bellied brent geese. Nationally important numbers of grey plover, dunlin, and black-tailed godwit are supported. Set in an urban area, there is a major port facility, and large-scale military activities occur at the site.
Solent and Southampton Water	Ramsar	Hydrologically connected to the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	The site exhibits an "unusual strong double tidal flow" and has long periods of slack water at high and low tide. It supports internationally important numbers of wintering waterfowl (51,361 over the winter) including ringed plover, teal and brent goose, important breeding gull and tern populations, and an impressive assemblage of rare invertebrates and plants.

Appendix 8-2 National statutory designated sites within 2km/hydrologically connected to the Scoping Area

Site Name	Designation	Distance from Scoping Area	Description
River Itchen	SSSI	Within the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	The Itchen is a chalk river and shows a greater uniformity in physical characteristics along its entire length than other rivers of this type. The river's vegetation is dominated by higher plants, and the aquatic flora is exceptionally species-rich with many typical chalk stream plants present in abundance. The Itchen supports one of the few populations of the native white-clawed crayfish remaining in the rivers of southern England and breeding otters. The Itchen valley contains areas of fen, swamp and meadow supporting vegetation with diverse plant communities, some species rich. These areas, together with semi-natural riparian vegetation bordering much of the river's courses, provide habitat for diverse invertebrate assemblages which include nationally rare and scarce species, including aquatic molluscs.
Langstone Harbour	SSSI	Within the Proposed Underground Pipeline between Budds Farm WTW and the proposed WRP.	Langstone Harbour is a tidal basin which at high water resembles an almost land-locked lake. The harbour includes one of the largest areas of mixed saltmarsh on the south coast, and extensive cord-grass *Spartina anglica* marsh in an advanced state of degeneration. The SSSI includes Farlington Marshes, a peninsula of grassland and marsh on reclaimed tidal silt protected by a sea wall; and a similar but much smaller area at Southmoor. The harbour is of international importance as a rich intertidal system supporting high densities of intertidal invertebrates and large populations of migrant and overwintering waders and wildfowl, dependent upon them and upon the extensive beds of eelgrass *Zostera species*. The *Zostera angustifolia* and *Z. noltii* beds are among the largest in Britain.

Site Name	Designation	Distance from Scoping Area	Description
Portsdown	SSSI	80m south of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Portsdown is an isolated east-west chalk anticline with a long south-facing escarpment which remains un-reclaimed. Diverse rich chalk grassland flora and insect fauna found at the site.
Hook Heath Meadows	SSSI	280m north of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Hook Heath Meadows comprise an intimate mixture of woodland and agriculturally unimproved acid pasture lying within a shallow river valley. Many of the habitats present are now rare in lowland Britain through agricultural intensification. This site is of particular value as an invertebrate habitat.
Waltham Chase Meadows	SSSI	400m north-east of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Comprises a group of unimproved neutral meadows, at present cut for hay. Collectively they represent one of the best examples in the county of dry neutral unimproved pasture. The flora is rich and includes a number of species now scarce or local, through habitat loss, such as: green-winged orchid *Orchis morio*, adder's-tongue *Ophioglossum vulgatum*, callous-fruited water-dropwort *Oenanthe pimpinelloides*, pepper-saxifrage *Silaum silaus*, southern marsh orchid *Dactylorhiza praetermissa* and cowslip *Primula veris*. The rich and varied flora supports a rich invertebrate fauna.
Botley Wood and Everett's and Mushes Copses	SSSI	510m south-west of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Comprises a large tract of woodland in a poorly drained low-lying hollow.
Lye Heath Marsh	SSSI	830m north-east of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Situated along a spring-line which, within a relatively small area, supports an intimate mixture of basic flushes, unimproved grassland, alder woodland and dense hedgerows, which combine to form a now rare association of individually restricted habitats.

Site Name	Designation	Distance from Scoping Area	Description
The Moors, Bishop's Waltham	SSSI	1.53km north-east of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Unimproved wet meadows, draining to a central pool with associated mature alder *Alnus carr*, occupying a small alluvial basin in the headwaters of a tributary of the River Hamble. The site supports a species-rich and ecologically diverse flora including many local or rare plants confined to unimproved, damp meadows. It is probably the richest site of its kind in the Hampshire Basin and the vegetation of the meadows exhibits an interesting juxtaposition of acid and basic elements.
Warblington Meadow	SSSI	1.91km south-east of the Proposed Underground Pipeline between Budds Farm WTW and the proposed WRP.	An unimproved grazing marsh adjoining Chichester Harbour, this SSSI is an unimproved grazing marsh and is of special interest for its gradation from freshwater, base-rich marsh to old reclaimed saltmarsh, and for its rich associated flora, with a total of 158 species of flowering plants having been recorded up to the time of notification. The freshwater marsh consists of a sedge-rush community with lesser pond sedge *Carex acutiformis*, false fox sedge *C. otrubae,* blue sedge *C. flacca,* carnation grass *C. panicea,* common sedge *C. nigra,* brown sedge *C. disticha and* oval sedge *C. ovalis growing together with* soft rush *Juncus effusus,* hard rush *J. inflexus,* sharp-flowered rush *J. acutiflorus* and jointed rush *J. articulatus*. The grass component is also high and the sward contains a number of locally distributed herbs.
Portsmouth Harbour	SSSI	Hydrological connectivity to the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Portsmouth Harbour is the westernmost of three extensive and connected tidal basins – Portsmouth, Langstone and Chichester Harbours – which share physical characteristics and, in many respects, should be seen as a single biological system. At high water they resemble large, nearly land-locked shallow lagoons. At low water extensive mudflats are exposed which are drained by systems of channels and creeks. The harbours have a salinity approximating to that of the sea but they do receive some fresh water from springs arising in the intertidal zone, and from a number of small streams, the largest of which is the River Wallington, which flows into Fareham Creek, the westernmost channel of Portsmouth Harbour.

Site Name	Designation	Distance from Scoping Area	Description
Moorgreen Meadows	SSSI	Hydrological connectivity to the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Neutral meadows and alder *Alnus wood* flanking a small tributary of the River Hamble. The sward comprises at least 17 co-dominant herbs and grasses and is of exceptional scientific importance for its populations of marsh orchids *Dactylorhiza*. In particular the site includes a geographically isolated population of the Northern Marsh Orchid *D. purpurella*, the nearest other localities being in Wales, Staffordshire and Yorkshire. The plants grow in close juxtaposition to four other species of the genus *Dactylorhiza* – early marsh orchid *D. incarnata*, common spotted orchid *D. fuchsii*, heath spotted orchid *D. maculata*, subspecies *ericetorum* and southern marsh orchid *D. praetermissa*. Hybrids between the five species occur in every combination and the site can thus be regarded as a 'hot bed' of micro-evolution.
Upper Hamble Estuary and Woods	SSSI	Hydrological connectivity to the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	This SSSI comprises the upper estuary of the River Hamble, together with adjoining saltmarsh, reed swamp and ancient semi-natural woodland. The woods have a diverse ground flora and invertebrate fauna. There is also a narrow zone of mudflats, with large numbers of marine worms, crustaceans and molluscs, which provide food for birds.
Titchfield Haven	SSSI	Hydrological connectivity to the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Titchfield Haven was formerly the estuary of the River Meon, which receives most of its water from the chalk. Tidal water is excluded by one-way tidal valves and the former estuary is an extensive freshmarsh, the river being flanked successively by common reed *Phragmites australis* beds and wet, unimproved meadows dissected by drainage ditches and further diversified by pools, 'flashes' and patches of fen. In addition, extensive 'scrapes' have been constructed. The area is an important resort for surface-feeding duck, with winter populations of 2,000 wigeon *Anas penelope*, 1,500 teal and smaller numbers of other surface feeding ducks. It possesses a rich wetland breeding bird community including bearded reedlings *Panurus biarmicus* and large populations of reed warblers *Acrocephalus scirpaceus* and sedge warblers *Acrocephalus schoenobaenus*

Site Name	Designation	Distance from Scoping Area	Description
Lincegrove and Hackett's Marshes	SSSI	Hydrological connectivity to the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Comprises is one of the best examples of saltmarshes on the south coast. It is dominated by sea purslane and common cordgrass *Sporobolus anglicus*, with other flora including sea lavender *Limonium platyphyllum*, thrift *Armeria maritima*, sea aster *Tripolium pannonicum* and sea clubrush *Bolboschoenus maritimus*. They are one of only eight extensive saltmarshes on the central south coast between Poole in Dorset and Pagham in West Sussex.
Lee-on-the-Solent to Itchen	SSSI	Hydrological connectivity to Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Comprised mainly of intertidal muds, there are also areas of saltmarsh, vegetated shingle, reedbeds, deciduous woodland and marshy grassland. It is outstanding for nationally scarce coastal plants, internationally important for dark-bellied brent geese, and nationally important for eight other species of birds, including great crested grebe *Podiceps cristatus* and ringed plover.
Bishops Waltham Branch Line	Local nature reserve (LNR)	290m north-east of Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Dismantled railway line lined by trees, including oak *Quercus robur*, hawthorn *Crataegus monogyna* and field maple *Acer campestre* supporting bird species, with a ground flora comprising flowering plants and male ferns *Dryopteris filix-mas*. The Kings Way and Pilgrims Trail routes pass through the LNR.
Farlington Marshes	LNR	590m from the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Farlington marshes is the Hampshire and Isle of Wight Wildlife Trust's oldest nature reserve. It is 125 hectares of flower-rich grazing marsh on the northern shore of Langstone harbour between Portsmouth and Havant.
Shawford Down	LNR	800m north of Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW..	Shawford Down is a 19.6 hectares site of chalk grassland and scrub, grazed with Highland cattle. The site supports chalk downland plants and butterflies.
Hazleton Common	LNR	890m north-east of the Havant Thicket Reservoir.	Area of lowland heath, with ponds and woodland areas. The site supports a range of species, including common lizard *Zootoca vivipara*, slow worm *Anguis fragilis*, adder *Vipera berus*, grass *snake Natrix natrix* and great crested newt *Triturus cristatus* have been identified in the main pond. A total of 26 ancient woodland indicator species have been identified in the

Site Name	Designation	Distance from Scoping Area	Description
			woodland areas and the site supports a diverse range of invertebrates and birds.
Claylands	LNR	910m north-east of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Comprised of secondary woodland, grassy and scrub covered south facing slopes, forming banks of an old clay working. A meadow which was landfill, two neutral grassland meadows and a number of ponds which support a population of great crested newts.
West Hayling	LNR	1.19km south of the Proposed Underground Pipeline between Budds Farm WTW and the proposed WRP.	Formerly known as the Hayling Oysterbeds, is home either permanently or on a migratory basis for tens and thousands of seabirds, which find that the thousands of hectares of intertidal mudflats contain a massive assemblage of marine invertebrate life.
Hayling Billy	LNR	1.25km south-east of the Proposed Underground Pipeline between Budds Farm WTW and the proposed WRP.	This old section of the Hayling Billy train supports rare plant species.
The Moors, Bishop's Waltham	LNR	1.53km east of the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW.	An area of semi-natural woodland, fen and grassland and open water. It is the main source of the Hamble River. Springs and streams feed a mill pond surrounded by a complex of woodland, fen and meadows. The meadow to the west of the Mill Pond is managed in a traditional way, being cut for hay and grazed by cattle. Orange Tip *Anthocharis cardamines* and Green-veined White *Pieris napi* butterflies lay their eggs on cuckoo flowers *Cardamine pratensis* in May. Other spring wildflowers typical of damp, herb rich meadows include water avens *Geum rivale*, marsh marigold *Caltha palustris* and the scarce common bistort *Bistorta officinalis*.
Dell Piece West	LNR	1.61km north-west of the Havant Thicket Reservoir.	Unimproved grassland area bordered by woodland, with damp marshy ground and a large shallow pond, which provides habitat for a rich variety of wildlife that includes various butterflies, dragonflies and reptiles.

Site Name	Designation	Distance from Scoping Area	Description
Titchfield Haven	LNR	Hydrological connectivity to the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW via the River Meon.	A wetland nature reserve with a rich habitat of rivers, marshlands and scrapes. A nationally renowned nature reserve providing a winter refuge for ducks, geese and wading birds, and summer breeding ground for avocet *Recurvirostra avosetta*.
Chessel Bay	LNR	Hydrological connectivity to the Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW via the River Itchen and its tributaries.	Chessel Bay is of great local importance, being the only remaining long stretch of natural shoreline in the lower reaches of the River Itchen. It also contains the only salt-marsh vegetation occurring within Southampton. A large proportion of the site is composed of mudflats and, at low tide, these provide major feeding grounds for wading birds and wildfowl.
Hackett's Marsh	LNR	Hydrological connectivity to Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW through via the River Hamble and its tributaries.	Comprises of saltmarshes and species-rich grassland, the saltmarsh vegetation is dominated by cord grass and saltmarsh grass with sea purslane, glasswort, sea lavender, thrift, sea aster, sea rush *Juncus maritimus* and sea clubrush. Its diverse insects, which include some species which are nationally rare, provide an important source of food for waders, such as golden plovers, black-tailed godwits and curlews.
Mercury Marshes	LNR	Hydrological connectivity to Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW via the River Hamble and its tributaries.	Located on the west bank of the River Hamble this site has intertidal mud, reedbeds, islands, saltmarsh, creeks and woodland. The saltmarsh and islands are dominated by sea purslane, cordgrass, sea aster and glasswort. The reserve is important for invertebrates and waders.
Hook with Warsash	LNR	Hydrological connectivity to Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne WSW via the River Hamble and its tributaries.	A shingle shore and intertidal flats that run along the edge of Southampton Water. Inland there are grazing pastures interspersed with tree lines, woodland and wetland habitats. Some of these habitats are rare and declining in the region. The foreshore and intertidal areas provide a winter feeding ground for many species of wading birds and wildfowl. Hook Spit is used by roosting turnstones as well as by a few pairs of breeding ringed plovers. The shingle zones have plant species such as sea kale *Crambe maritima*, sea beet *Beta vulgaris* and yellow-horned poppy *Glaucium flavum*.

Site Name	Designation	Distance from Scoping Area	Description
			The areas of grassland and scrub on Hook Links support a variety of breeding birds including linnets *Linaria cannabina*, meadow pipits *Anthus pratensis* and skylarks *Alauda arvensis*.
The Kench, Hayling Island	LNR	Hydrological connectivity to the proposed WRP and Proposed Underground Pipeline between Budds Farm WTW and the proposed WRP via Langstone Harbour.	A small area of inter-tidal mud and saltmarsh within Langstone Harbour. This shallow tidal inlet alongside Ferry Road on Hayling Island is used by many birds as a feeding area and when the tide is high the shingle ridge between the inlet and the main harbour is used as a roost by wading birds.

Appendix 8-3: Non-statutory Designated Sites within the Scoping Area and associated criteria

1.11 Non-statutory Designated Sites Criteria

Code	Criteria
1A	Ancient Semi-natural Woodlands
1B	Other woodland where there is a significant element of ancient semi-natural woodland surviving
1C	Other semi-natural woodland if they comprise important community types of restricted distribution in the county, such as yew woods and alder swamp woods
1Ci	Yew Woods
1Cii	Wet Woodlands such as Alder or Willow Woods and Birch Bog Woods which Support a Good Diversity of Woodland and/or Marsh/Swamp/Mire Species
1D	Pasture woodland and wooded commons not included in any of the above which are of considerable biological and historical interest
1E	Hedgerows
1F	Traditional Orchards
1G	Ancient and veteran trees which occur outside any of the previously defined woodland categories
2A	Agriculturally unimproved grasslands which are not of recent origin
2Ai	Lowland Meadow (Neutral Grassland)
2Aii	Lowland Dry Acidic Grassland (Acid Grassland)
2Aiii	Lowland Calcareous Grassland (Calcareous Grassland)
2B	Semi-improved grasslands which retain a significant element of unimproved grassland
2Bi	Grasslands with species-rich fungal communities (“waxcap grasslands”)
2C	Grassland of Recent Origin of a Significant Size and Species Diversity
2Ci	Grasslands created by deliberate addition of plant material
2Cii	Early successional grasslands developing by natural colonisation
2D	No 2D criteria outlined within guidance document
3A	Areas of Heathland Vegetation including mosaics of dwarf shrub heath, acidic grassland, valley mire and scrub
3B	Areas of Heathland which are afforested or have succeeded to woodland
4A	Semi-natural coastal and estuarine habitats (including saltmarsh, intertidal mudflats, sand dunes, brackish ponds, saline lagoons, inundation grasslands of the coastal plain, maritime cliffs and maritime grasslands
4Ai	Coastal Grazing marsh
4Aii	Coastal Saltmarsh
4Aiii	Coastal sand-dunes
4Aiv	Coastal Vegetated Shingle
4Av	Intertidal Mudflats and Seagrass Beds

Code	Criteria
4Avi	Maritime Cliffs and Slopes
4Avii	Saline Lagoons
5A	Areas of open freshwater (e.g. lakes, ponds, canals, rivers, streams and ditches)
5Ai	Areas of open freshwater which support good floristic assemblages
5Aii	Wetlands which support significant assemblages of invertebrates, birds or amphibians
5Aiii	Wetlands which have a high water quality status or a high biotic index
5B	Fens, flushes, seepages, springs and inundation grasslands of floodplains that support a flora and fauna of less-improved wet conditions (seasonal or permanent).
5Bi	Coastal and Floodplain Grazing Marsh
5Bii	Spring-fed fens and flushes
5Biii	Purple Moor-grass and Rush-pasture
6A	Sites which support one or more Hampshire Notable Species
6B	Sites which regularly support a significant population of a Hampshire Notable Species but which are used seasonally or for only one part of a species life-cycle.
6C	Sites which support an outstanding assemblage of species.
7A	Sites of nature conservation interest which occur in areas otherwise deficient in such interest, and/or are known to be of particularly high value to local communities
8A	Sites designated as Local Geological Sites, formerly known as Regionally Important Geological and Geomorphological Sites (RIGS)
9A	Sites which possess a rich mosaic of habitats and/or have an outstanding assemblage of species
10A	Sites which support outstanding assemblages of arable plant or animal species either within whole fields or along margins
11A	Habitat mosaics

1.12 Non-statutory sites within 200m of the Scoping Area

Site Name	Designation	Approximate Distance to the Scoping Area (m)	Criteria
Bell's Copse	SINC	Within Havant Thicket Reservoir.	1A/1B
Blendworth Common (North)	SINC	Within Havant Thicket Reservoir.	2Ai/5Biii
Blendworth Common (South)	SINC	Within Havant Thicket Reservoir.	2A
Cabbagefield Row	SINC	Within Havant Thicket Reservoir.	1A
Dunsbury Hill Grassland 2	SINC	Within Havant Thicket Reservoir.	2B
Dunsbury Hill Wood	SINC	Within Havant Thicket Reservoir.	1Cii
Hammond's Lands Copse	SINC	Within Havant Thicket Reservoir.	1A
Havant Thicket	SINC	Within Havant Thicket Reservoir.	1B/1Cii/1D/2B/3Bi/5B/6A
Havant Thicket (South-West Corner)	SINC	Within Havant Thicket Reservoir.	1B/3Bi
Idsworth Common	SINC	Within Havant Thicket Reservoir.	1B/1D/6A
Meadow by Bells Copse	SINC	Within Havant Thicket Reservoir.	2A/2D
Middle Clearing	SINC	Within Havant Thicket Reservoir.	1A/6A
The Holt	SINC	Within Havant Thicket Reservoir.	1A/3Bi/6A
Thicket Bottom	SINC	Within Havant Thicket Reservoir.	1D
Thicket Bottom Woods & Lake	SINC	Within Havant Thicket Reservoir.	1A
Thicket Lawn	SINC	Within Havant Thicket Reservoir.	2B/5B
Birkdale Avenue	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2Aiii
Camp Down Grassland Remnants	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2D

Site Name	Designation	Approximate Distance to the Scoping Area (m)	Criteria
Carpenters Copse	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Chestnut Gully Wood	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Colden Common Wood & Blacknells Copse	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Dell Row South	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
East and West of Gillman Road	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2B/6A
Farlington Avenue	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2B
Field to West of Gillman Road	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2B
Fielders Farm Meadows (Eastleigh)	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2D/5B/6A
Fielders Farm Meadows (Winchester)	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2D

Site Name	Designation	Approximate Distance to the Scoping Area (m)	Criteria
Fields off Havant Road	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	6A
Finches Copse	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Great Copse, Havant	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
High Lawn	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2B/5B
Hill Copse, Fair Oak and Horton Heath	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Kimbers Copse	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A/1B
Land to the north of Portsdown Hill Road	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2B/6A
Land to the South of Portsdown Hill Road	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2A/2B
London Road Fen	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1Cii/5B

Site Name	Designation	Approximate Distance to the Scoping Area (m)	Criteria
Meadow west of Farlington Avenue	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2D
Motte & Bailey & Chalk Pit	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Oakwood Copse	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Otterbourne Wood	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Park Hills Wood	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Perrige's Coppice	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Portsmouth City Golf Course Copse	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW..	1B/6A
Portsmouth Golf Course East	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2B/2D
Portsmouth Golf Course West	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	2B/2D

Site Name	Designation	Approximate Distance to the Scoping Area (m)	Criteria
Purbrook Park Wood	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Ravenswood Row	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Redhill Copse, Wickham	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
River Meon (Winchester)	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1Cii/5A/5B
Sandy & Aldermoor Coppices	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Sparrowgrove Copse	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Tankerhill Copse	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
The Mount, Fair Oak and Horton Heath	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A
Knowle Copse/Dash Wood/Ravens Wood	SINC	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	1A/6A

Site Name	Designation	Approximate Distance to the Scoping Area (m)	Criteria
Birkdale Avenue	RVEI	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	North verge along residential area of Birkdale Avenue and southern verge of Troon Crescent
Farlington Avenue	RVEI	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	North verge along residential area of Farlington Avenue, starting just past the junction with Birkdale Avenue, continuing onto Burnham Road.
B2177 Portsdown Hill Road	RVEI	Within the proposed underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.	Both sides of Portsdown Hill Road, between C423 Crookhorn Lane and Farlington Redoubt entrance
Knowle Copse/Dash Wood/Ravens Wood	SINC	0.0	1A/6A
Blendworth Common (South)	SINC	0.3	2A
Dell Row	SINC	0.6	1A
Blendworth Common (North) candidate amendment	SINC	1.2	2A/5Bii
Homerhill Copse & The Hanger	SINC	1.4	1A
Durley Roughett	SINC	1.8	2A
Calcot Farm Meadow 2	SINC	2.3	2A
Marls & Stroud Coppices	SINC	2.4	1B
Pinsley Complex	SINC	2.7	1A
St. Anne's Wood	SINC	2.9	1B
Fishers Pond Wood	SINC	2.9	1A

Site Name	Designation	Approximate Distance to the Scoping Area (m)	Criteria
Great Breach Row	SINC	2.9	1A
Stroud Coppice Field	SINC	3.2	2D
Carmans Copse	SINC	3.9	1A
Wickham Meadow	SINC	4.0	2A
Birchfrith Copse	SINC	4.2	1A/1B
Quob Copse	SINC	4.3	1B
Knowle Hospital Row	SINC	4.5	1A/1B/6A
Ham Coppice	SINC	4.8	1A
Moor Coppice	SINC	6.7	1A
Hookheath Scrubs	SINC	6.9	1A/1Cii
Buck's Copse	SINC	7.5	1A
Opposite Carmans Copse	SINC	7.5	1A
Field East of Farlington Redoubt (North)	SINC	8.7	2B
P203 Mayles Lane	SINC	10.0	South side of P203 Mayles Lane, road verge of Dash Wood
Pigeonhouse Coppice	SINC	10.6	1A
Birching Copse	SINC	11.3	1A
Ashleydown Coppice	SINC	12.3	1B
Pitymoor Lane Wood	SINC	12.7	1A
Gravelhole Copse	SINC	13.2	1A
Gravelhole Copse (South-West)	SINC	14.2	1A
Orchard Copse, Boarhunt	SINC	14.9	1A/6A
Hookheath Meadows (G3-G7)	SINC	15.9	1Cii/2B/5B
Pigeonhouse Row	SINC	17.1	1A

Site Name	Designation	Approximate Distance to the Scoping Area (m)	Criteria
Woodland Strip East of Dirtystile Coppice	SINC	20.4	1A
Grub Coppice/Mill Coppice	SINC	20.6	1A/1B
Crooked Walk Meadow	SINC	20.7	2D
Rowlands Castle Golf Course	SINC	22.3	2A/6A
Walton Heath/Ashlands/Staplecross	SINC	24.4	1B
Wickham Common	SINC	32.6	1Cii/1D/2B/3A
Sandy Dell	SINC	39.6	1A
Gravelpit Copse	SINC	56.5	1B
Lower Beacon Field	SINC	65.5	2B/5B
Shedfield Common	SINC	66.2	1D/2B/3A/6A
Fort Purbrook Paddock 1 (Havant)	SINC	69.3	2B/6A
Fort Purbrook Paddock 2 (Havant)	SINC	69.8	2B
Fort Purbrook	SINC	70.3	2A/6A
Farlington Marshes Grassland (North-East)	SINC	70.3	2A/4A
Fort Purbrook Paddock 3 (Havant)	SINC	70.6	2B
Fort Purbrook Paddock 4 (Havant)	SINC	71.7	2Aiii
Wintershill Farm Woodland	SINC	73.7	1A/1B/1Cii
Lord's Wood, Colden Common	SINC	77.6	1A
Cutlers Copse	SINC	81.5	1B
Upperbarn Copse	SINC	82.2	1B
Aldermoor Meadow Part	SINC	90.5	5B
Fort Widley and Surrounds	SINC	90.5	2B/2D/6A
Pyle Farm Meadow South	SINC	91.4	2A
Wakefords Copse, Havant	SINC	95.9	1A

Site Name	Designation	Approximate Distance to the Scoping Area (m)	Criteria
Broomground Coppice/Potwell Coppice	SINC	109.3	1A/1B/1Cii/6A
Mill Farm Woodland	SINC	110.0	1A/1Cii
Southwick Meadow	SINC	118.6	2D
Alma Meadows (North)	SINC	128.3	2A
Mincingfield Copse	SINC	144.1	1A
Blakes Copse	SINC	145.3	1A
Dunsbury Hill - Areas 5 & 6	SINC	152.5	2A
Crooked Walk Banks	SINC	157.4	2A
Lower Upham Meadow	SINC	162.2	2A
Dunsbury Hill - Area 1	SINC	163.7	2A
Peatmoor, Shedfield	SINC	169.0	1Cii/5B
Southmoor - Big Field (south edge)	SINC	170.5	4A
Calcot Farm Meadow 1	SINC	171.5	1A/2B/6A
Blacknell's Copse Paddock	SINC	175.3	2A
Church of The Holy Trinity	SINC	184.1	2A
Oaklands Meadows 1 & 2	SINC	187.1	2B/2D/6A
Pitymoor Coppice	SINC	191.4	1A
Meadows at Allbrook	SINC	196.5	2D
Martin's Copse	SINC	199.2	1A
Venables Coppice	SINC	199.2	1A

Appendix 9-1 List of policies relevant to the marine biodiversity chapter in the South Inshore and Offshore Marine Plan

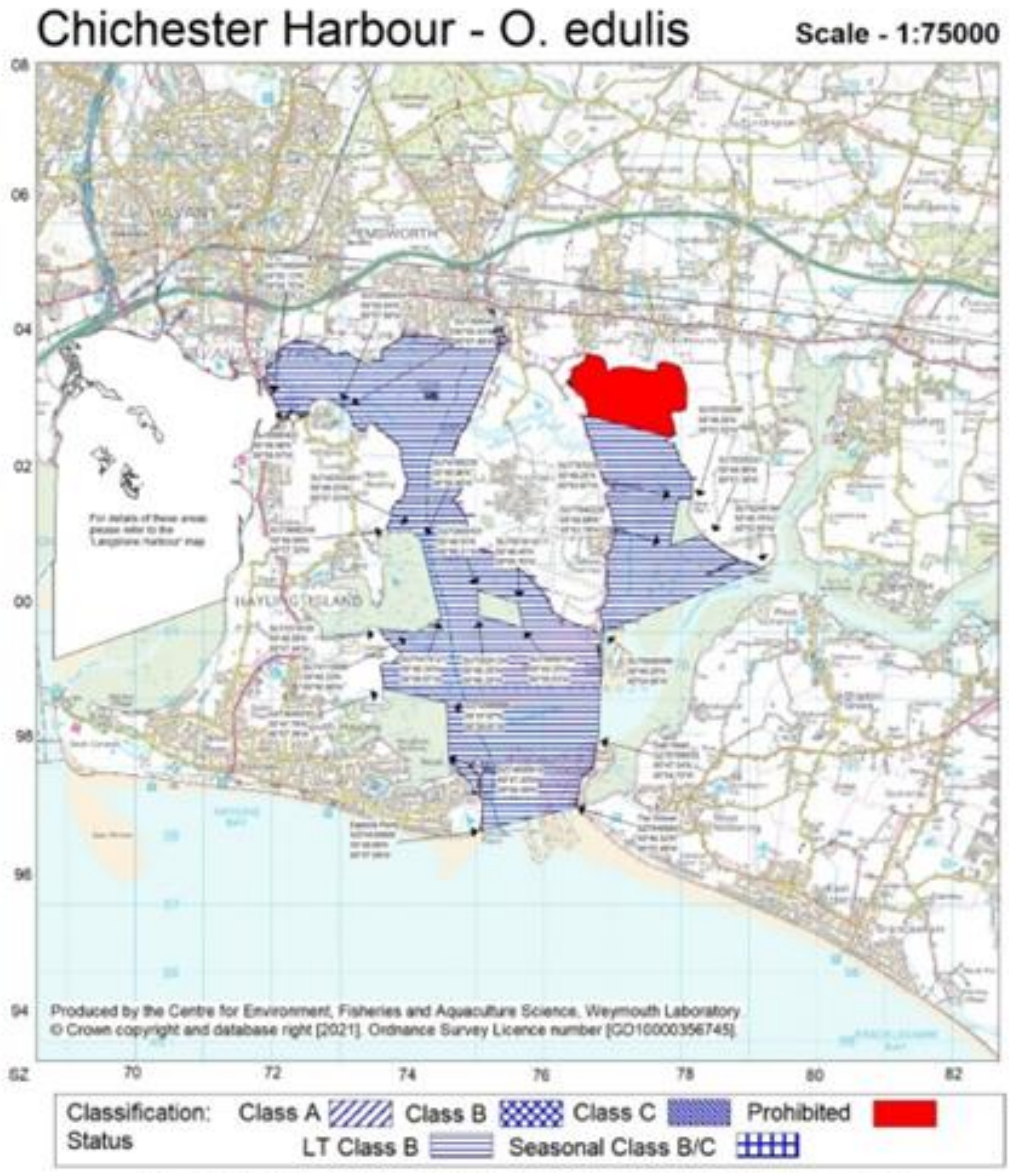
Policy		Policy Aim
Objective 1: To encourage effective use of space to support existing, and future sustainable economic activity through co-existence, mitigation of conflicts and minimisation of development footprints.		
S-CO-1	Proposals will minimise their use of space and consider opportunities for co-existence with other activities.	Space within the south marine plan areas is limited and required to realise social, environmental and economic benefits. S-CO-1 enables proposals to be spatially planned and make appropriate use of available space by minimising footprints. Those activities that can co-exist, should do so.
Objective 5: To avoid, minimise, mitigate displacement of marine activities, particularly where of importance to adjacent coastal communities, and where this is not practical to make sure significant adverse impacts on social benefits are avoided.		
S-FISH-2	Proposals that may have significant adverse impacts on access to, or within, sustainable fishing or aquaculture sites must demonstrate that they will, in order of preference: a) avoid, b) minimise, c) mitigate significant adverse impacts, d) if it is not possible to mitigate the significant adverse impacts, proposals should state the case for proceeding.	Sustainable fishing and aquaculture industries provide benefits to coastal communities and contribute to UK food security. These activities are restricted in where they can operate, making them vulnerable to loss of access caused by surrounding sea use. S-FISH-2 limits impacts of other marine activities on fishing and aquaculture access, enabling maximum marine resource use and generating prosperous resilient and cohesive coastal communities.
Objective 10: To support marine protected area objectives and a well-managed ecologically coherent network with enhanced resilience and capability to adapt to change.		
S-MPA-1	Proposals that support the objectives of marine protected areas and the ecological coherence of the marine protected area network will be supported. Proposals that may have adverse impacts on the objectives of marine protected areas and the ecological coherence of the marine protected area network must demonstrate that they will, in order of preference: a) avoid, b) minimise, c) mitigate adverse impacts, with due regard given to statutory advice on an ecologically coherent network.	The UK government is committed to establishing a network of marine protected areas, creating a 'Blue Belt' of protected areas around the country. The south marine plan areas will make a significant contribution to this network, through the many existing and proposed marine protected area sites. S-MPA-1 makes sure proposals take account of adverse impacts on individual sites and the overall network, protecting important habitats, species and geological features, enabling the successful and continued management of these sites
S-MPA-2	Proposals that enhance a marine protected area's ability to adapt to climate change and so enhance the resilience of the marine protected area network will be supported.	The effects of climate change on habitats and species poses a challenge to designated marine protected area sites in the south marine plan areas.

Policy		Policy Aim
	Proposals that may have adverse impacts on an individual marine protected area's ability to adapt to the effects of climate change and so reduce the resilience of the marine protected area network, must demonstrate that they will, in order of preference: a) avoid, b) minimise, c) mitigate adverse impacts.	S-MPA-2 makes sure proposals account for adverse impacts on individual marine protected areas ability to adapt to climate change, improving resilience and working towards a well-managed marine protected area network.
S-MPA-4	Until the ecological coherence of the marine protected area network is confirmed, proposals should demonstrate that they will, in order of preference: a) avoid, b) minimise, c) mitigate adverse impacts on features that may be required to complete the network, d) if it is not possible to mitigate adverse impacts, proposals should state the case for proceeding.	It is important to make sure that possible locations for further marine protected areas, which may be needed to complete the network, remain in sufficient condition to merit designation. S-MPA-4 makes sure proposals do not prevent the future inclusion of features which may be required to enhance network coherence. The focus of S-MPA-4 is on Features of Conservation Importance, priority habitats and species, and Annex 1 habitats.
Objective 11: To complement and contribute to the achievement or maintenance of Good Ecological Status or Potential under the Water Framework Directive and Good Environmental Status under the Marine Strategy Framework Directive, with respect to descriptors for marine litter, non-indigenous species and underwater noise.		
S-UWN-1	Proposals generating impulsive sound, must contribute data to the UK Marine Noise Registry as per any currently agreed requirements. Public authorities must take account of any currently agreed targets under the UK Marine Strategy part one descriptor 11.	Impulsive sounds can have an adverse effect on marine life and human enjoyment of marine areas. S-UWN-1 supports the newly established noise registry to record, assess, and manage the distribution and timing of impulsive sounds sources. S-UWN-1 encourages data collection to determine current baselines and levels of impulsive sound in the marine environment enabling effective marine management and protection of biodiversity or viable populations of species.
S-UWN-2	Proposals that generate impulsive sound and/or ambient noise must demonstrate that they will, in order of preference: a) avoid, b) minimise, c) mitigate significant adverse impacts on highly mobile species, d) if it is not possible to mitigate significant adverse impacts, proposals must state the case for proceeding.	Underwater noise levels have increased with marine space use. Noise can affect highly mobile species, including causing chronic stress and death at higher intensities. S-UWN-2 supports management of underwater noise requiring proposals to take appropriate noise reduction actions. S-UWN-2 enables clear and proportionate regulation to make sure marine activity respects environmental limits and protects biodiversity.
S-WQ-1	Proposals that may have significant adverse impacts upon water environment, including upon habitats and species that can be of benefit to water quality must demonstrate that they will, in order of preference: a)	Much of the economic and cultural prosperity of the south marine plan areas is reliant on water quality. Activities can place stress on water bodies such that, in parts of the south marine plan areas water quality requires improvement. S-WQ-1 seeks to manage impacts on water quality, and

Policy		Policy Aim
	avoid, b) minimise, c) mitigate significant adverse impacts.	the habitats and species which benefit water quality through the ecosystem service they provide.
S-WQ-2	Activities that can deliver an improvement to water environment or enhance habitats and species which can be of benefit to water quality should be supported.	Habitats such as coastal saltmarsh, intertidal mudflats, seagrass, reed beds and natural blue mussel beds provide ecosystem services which maintain and can improve water quality. S-WQ-2 encourages activities improving water quality including habitat restoration, bioremediation and voluntary measures.
Objective 12: To safeguard space for, and improve the quality of, the natural marine environment, including to enable continued provision of ecosystem goods and services, particularly in relation to coastal and seabed habitats, fisheries and cumulative impacts on highly mobile species.		
S-BIO-1	Proposals that may have significant adverse impacts on natural habitat and species adaptation, migration and connectivity must demonstrate that they will, in order of preference: a) avoid, b) minimise c) mitigate significant adverse impacts.	Competition for space, increased levels of development and predicted effects of climate change can affect the south marine plan areas' natural habitats and species connectivity, ability to adapt to change and migrate. S-BIO-1 requires proposals to manage negative effects which may not enable the functioning of healthy, resilient and adaptable marine ecosystems
S-BIO-2	Proposals that incorporate features that enhance or facilitate natural habitat and species adaptation, migration and connectivity will be supported.	S-BIO-2 supports proposals that incorporate features that enhance or facilitate natural habitat and species adaptation, migration and connectivity, enabling the environment to respond to climate change and development. This may include novel designs, and collaboration between developers and public authorities.
S-BIO-3	Proposals that enhance coastal habitats where important in their own right and/or for ecosystem functioning and provision of goods and services will be supported. Proposals must take account of the space required for coastal habitats where important in their own right and/or for ecosystem functioning and provision of goods and services and demonstrate that they will, in order of preference: a) avoid, b) minimise, c) mitigate for net loss of coastal habitat.	In the south inshore marine plan area there is a lack of space for coastal habitats. This is due to coastal squeeze, a process where habitats have decreasing space between rigid coastal structures and rising sea level or coastal erosion. S-BIO-3 requires proposals to manage their impacts on these habitats to support the functioning of healthy, resilient and adaptable marine ecosystems.
S-BIO-4	Proposals that enhance the distribution and net extent of priority habitats should be supported. Proposals must demonstrate that they will avoid reducing the	Maintaining the extent and distribution of priority and coastal habitats is important as it reduces habitat fragmentation, species isolation and supports strong, biodiverse biological communities. S-BIO-4 maintains the distribution and net extent of priority habitats throughout the

Policy		Policy Aim
	distribution and net extent of priority habitats.	south marine plan areas by ensuring proposals do not adversely affect them.
S-FISH-4	Proposals that enhance essential fish habitat, including spawning, nursery and feeding grounds, and migratory routes should be supported. Proposals must demonstrate that they will, in order of preference: a) avoid, b) minimise, c) mitigate significant adverse impact on essential fish habitat, including, spawning, nursery, feeding grounds and migration routes.	Sustainable fish populations rely upon specific habitats throughout their life. S-FISH-4 recognises protection of habitats and the services they provide can enhance fish populations, supporting the long-term existence of the fisheries and contributing to Good Environmental Status. S-FISH-4 enables sustainable use of marine resources within environmental limits alongside productive fisheries by requiring proposals to manage impacts on these habitats.
S-FISH-4-HER	Proposals will consider herring spawning mitigation in the area highlighted on Figure 26 (in the technical annex of the plans) during the period 01 November to the last day of February annually.	The south marine plan areas include a number of important herring spawning zones; these are located within the Southern Bight and Downs areas. S-FISH-4-HER highlights these zones and makes sure proposals mitigate any potential impacts. Specific mitigation measures are provided. S-FISH-4-HER identifies areas where development is now able to take place if impacts are mitigated. This will enable sustainable development whilst protecting herring stock.

Appendix 9-2 Classified shellfish production areas



Classification of Bivalve Mollusc Production Areas: Effective from 1 September 2021

The areas delineated above are those classified as bivalve mollusc production areas under Regulation (EU) 2019/627.

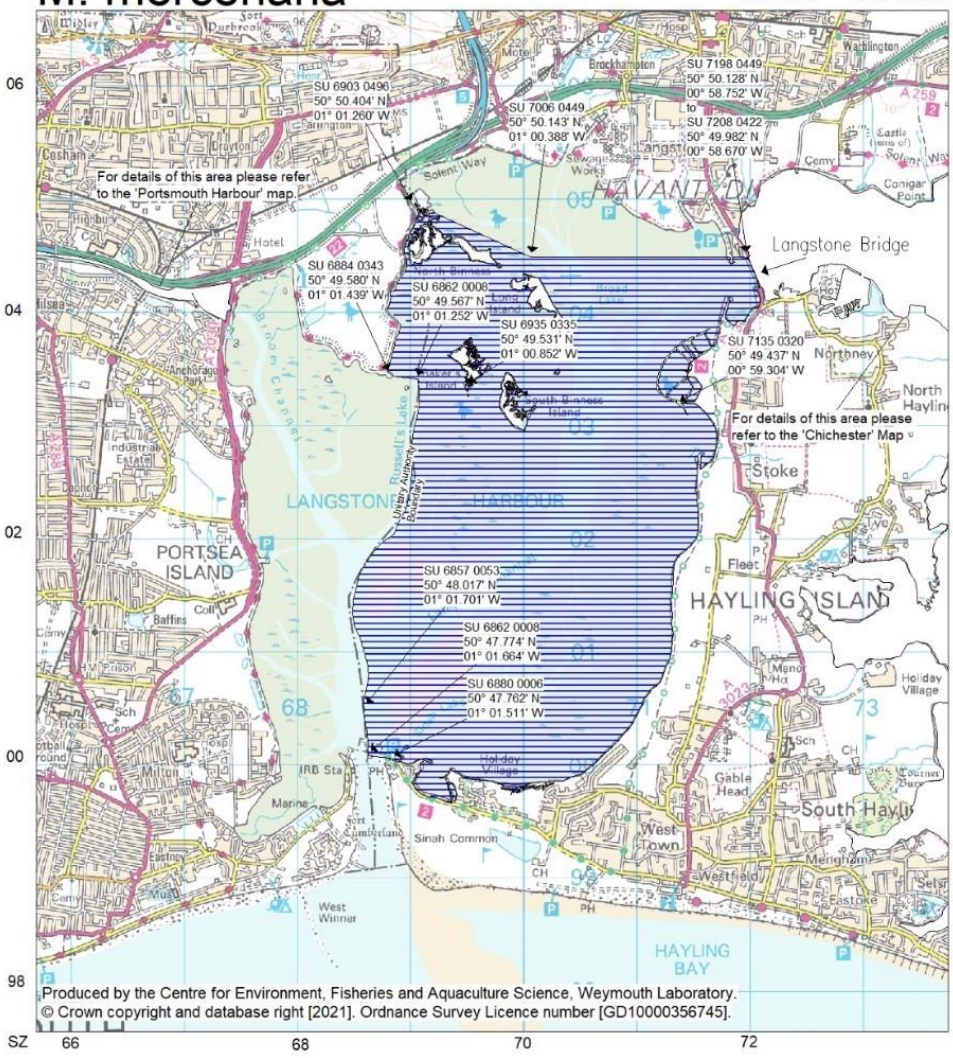
Further details on the classified species and the areas may be obtained from the responsible Food Authority. Enquiries regarding the maps should be directed to: Shellfish Microbiology, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB.
(Tel: 01305 206600 Fax: 01305 206601)

N.B. Lat/Longs quoted are WGS84
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.
Separate maps available for Tapes spp. and C. edule at Chichester Harbour

Food Authorities: Havant Borough Council
Chichester District Council

Langstone Harbour - M. mercenaria

Scale - 1:50000



Classification: Class A | Class B | Class C | Prohibited
Status: LT Class B | Seasonal Class B/C

Classification of Bivalve Mollusc Production Areas: Effective from 1 September 2021

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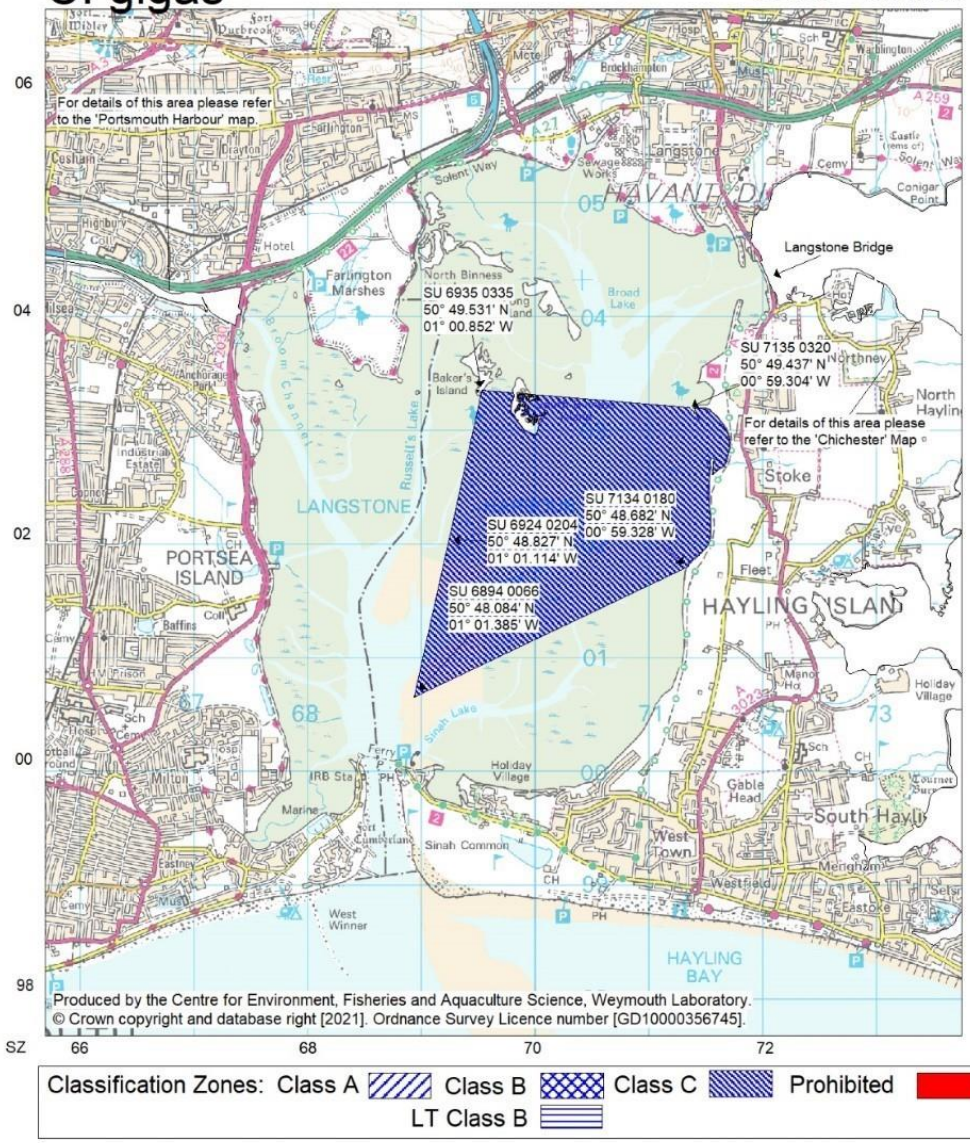
(Tel: 01305 206600 Fax: 01305 206601)

N.B. Lat/Longs quoted are WGS84
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.

Food Authority: Portsmouth Port Health Authority

Langstone Harbour - C. gigas

Scale - 1:50000



Classification of Bivalve Mollusc Production Areas: Effective from 1 September 2021

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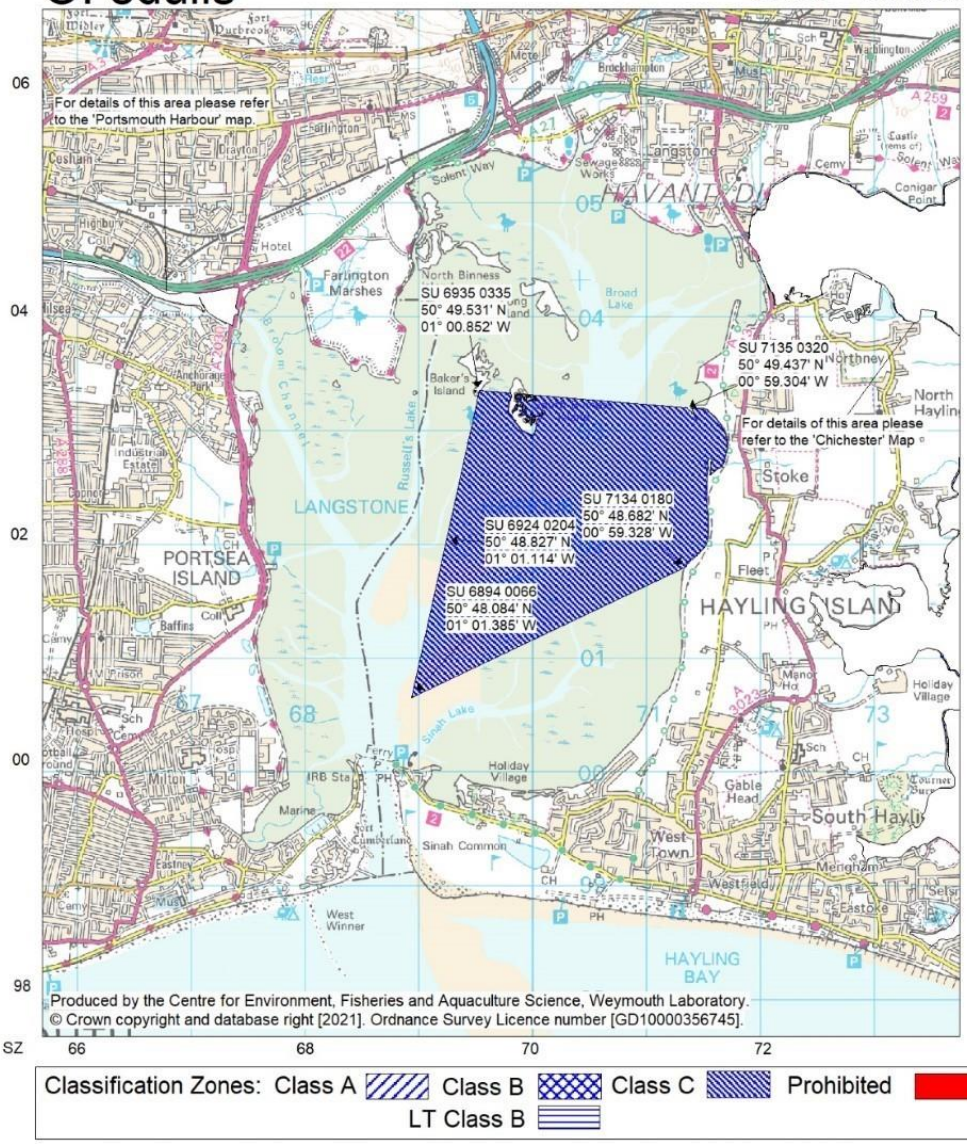
(Tel: 01305 206600 Fax: 01305 206601)

N.B. Lat/Longs quoted are WGS84
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.
Separate maps available for O. edulis and M. mercenaria at Langstone Harbour

Food Authority: Portsmouth Port Health Authority

Langstone Harbour - O. edulis

Scale - 1:50000



Classification Zones: Class A | Class B | Class C | Prohibited | LT Class B

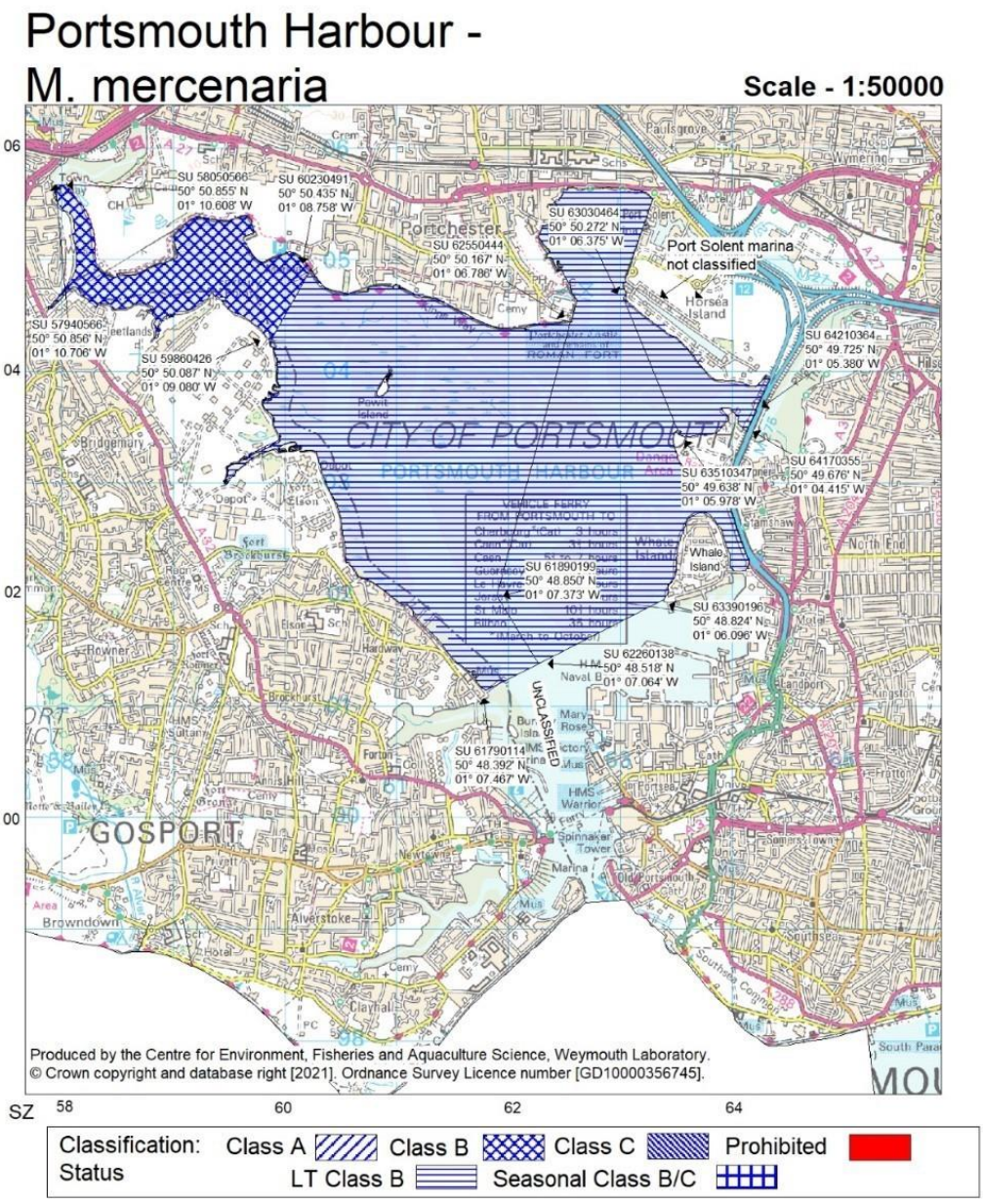
Classification of Bivalve Mollusc Production Areas: Effective from 1 September 2021

The areas delineated above are those classified as bivalve mollusc production areas under Regulation (EU) 2019/627.

Further details on the classified species and the areas may be obtained from the responsible Food Authority. Enquiries regarding the maps should be directed to: Shellfish Microbiology, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB.
(Tel: 01305 206600 Fax: 01305 206601)

N.B. Lat/Longs quoted are WGS84
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.
Separate maps available for M. mercenaria at Langstone Harbour

Food Authority: Portsmouth Port Health Authority



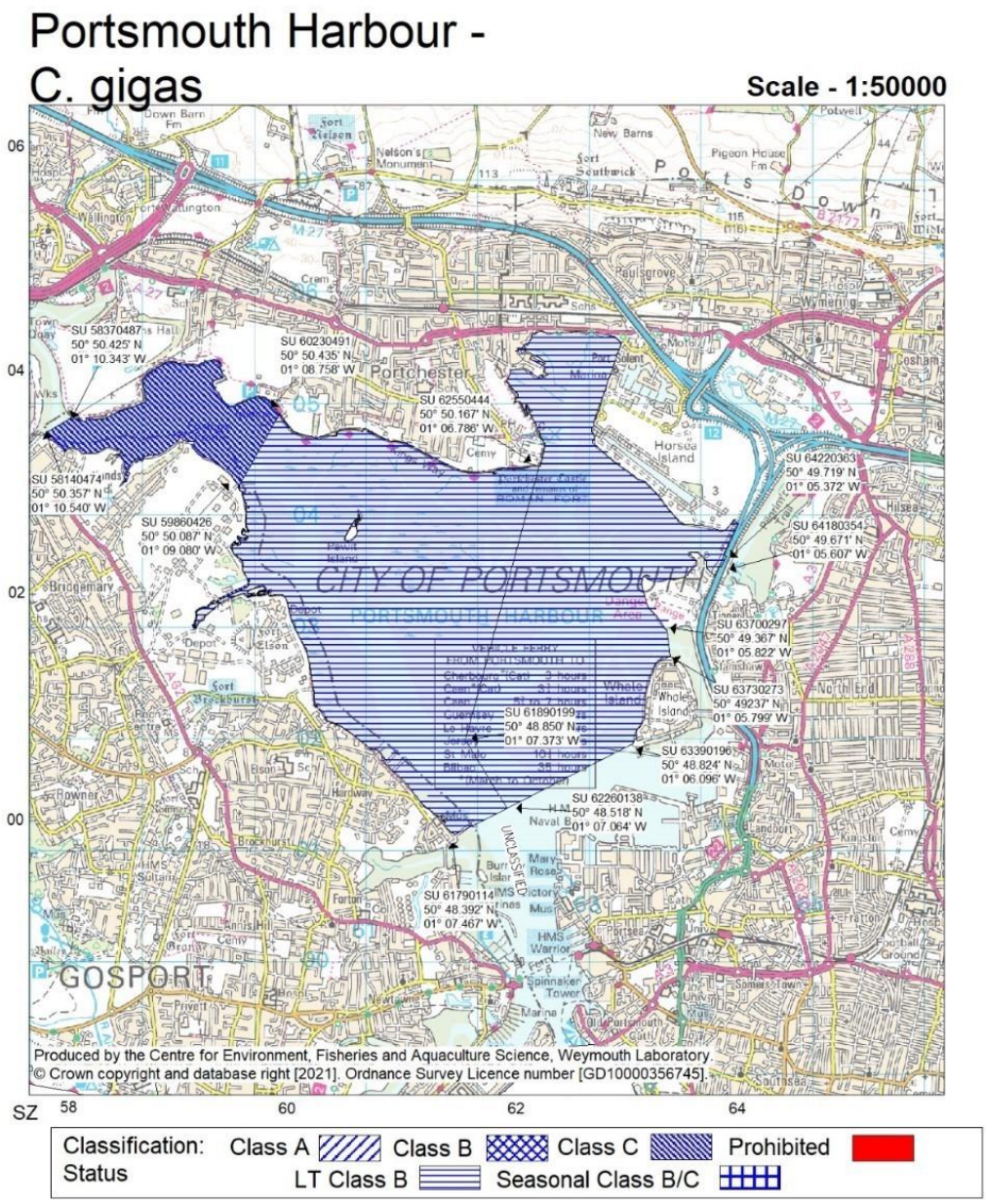
Classification of Bivalve Mollusc Production Areas: Effective from 1 September 2021

The areas delineated above are those classified as bivalve mollusc production areas under Regulation (EU) 2019/627.

Further details on the classified species and the areas may be obtained from the responsible Food Authority. Enquiries regarding the maps should be directed to: Shellfish Microbiology, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB.
(Tel: 01305 206600 Fax: 01305 206601)

N.B. Lat/Longs quoted are WGS84
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.
Separate maps available for Tapes spp. and C. edule at Portsmouth Harbour

Food Authority: Portsmouth Port Health Authority



Classification of Bivalve Mollusc Production Areas: Effective from 1 September 2021

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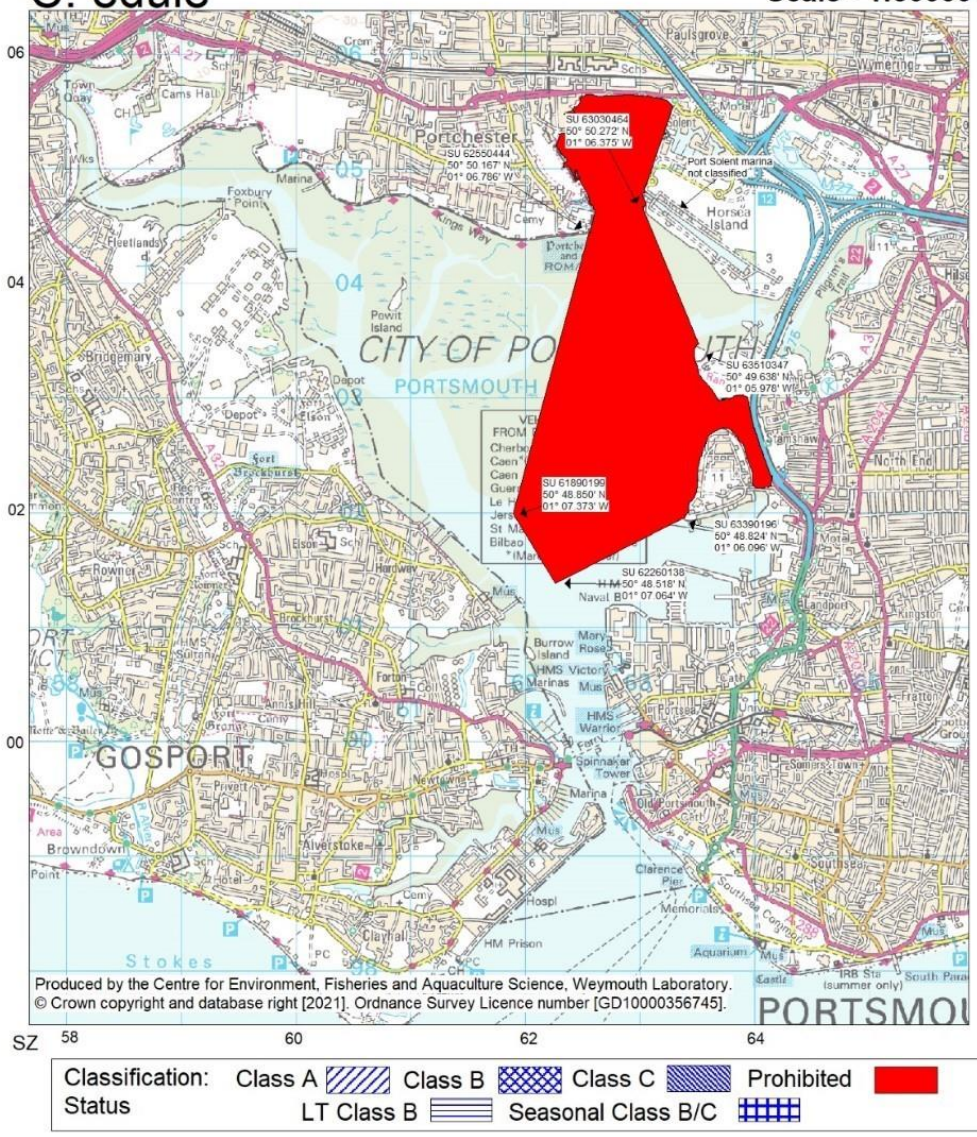
Further details on the classified species and the areas may be obtained from the responsible Food Authority. Enquiries regarding the maps should be directed to: Shellfish Microbiology, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB.
(Tel: 01305 206600 Fax: 01305 206601)

N.B. Lat/Longs quoted are WGS84
Seperate maps available for O. edulis, C. edule, Tapes spp. and M. mercenaria at Portsmouth Harbour
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.

Food Authority: Portsmouth Port Health Authority

Portsmouth Harbour - C. edule

Scale - 1:50000



Classification: Class A | Class B | Class C | Prohibited
Status: LT Class B | Seasonal Class B/C

Classification of Bivalve Mollusc Production Areas: Effective from 1 September 2021

The areas delineated above are those classified as bivalve mollusc production areas under Regulation (EU) 2019/627.

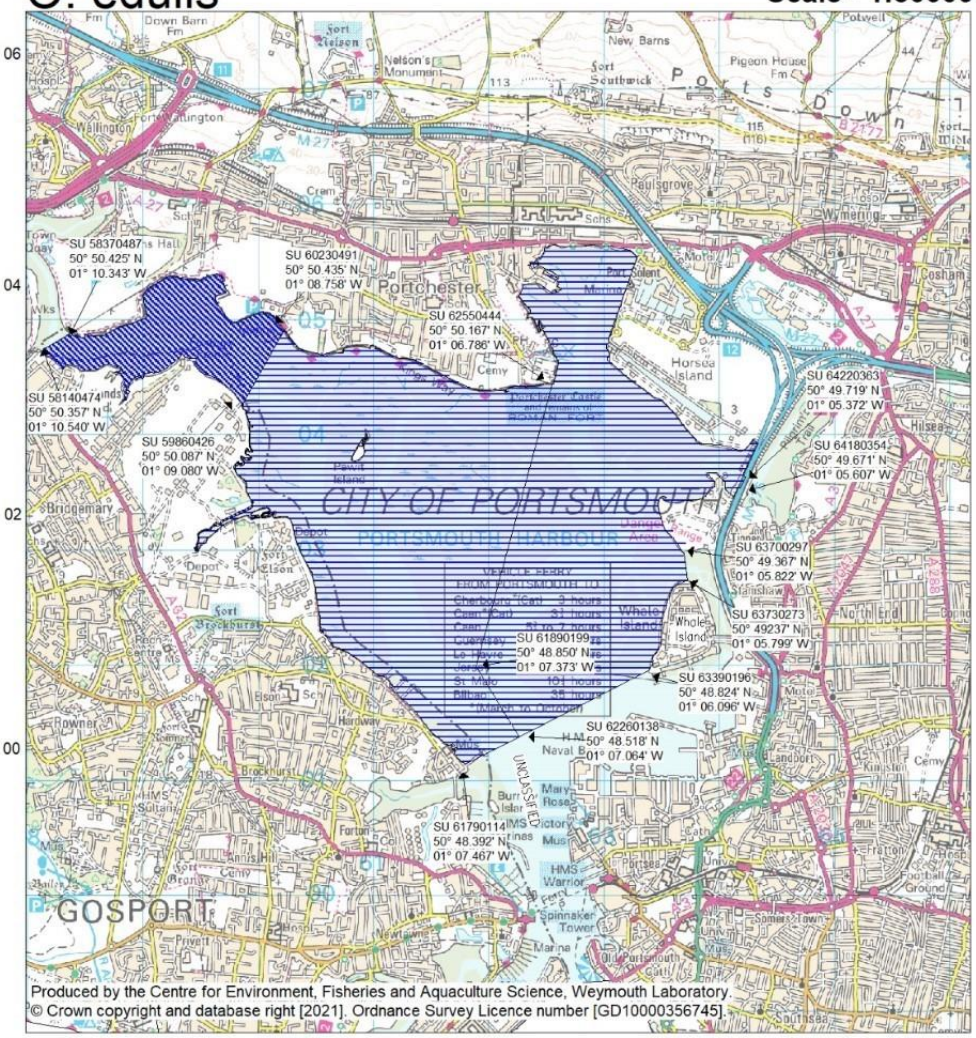
Further details on the classified species and the areas may be obtained from the responsible Food Authority. Enquiries regarding the maps should be directed to: Shellfish Microbiology, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB.
(Tel: 01305 206600 Fax: 01305 206601)

N.B. Lat/Longs quoted are WGS84
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.
Separate maps available for Tapes spp. and M. mercenaria at Portsmouth Harbour

Food Authority: Portsmouth Port Health Authority

Portsmouth Harbour - O. edulis

Scale - 1:50000



Classification: Class A | Class B | Class C | Prohibited
Status: LT Class B | Seasonal Class B/C

Classification of Bivalve Mollusc Production Areas: Effective from 1 September 2021

The areas delineated above are those classified as bivalve mollusc production areas under Regulation (EU) 2019/627.

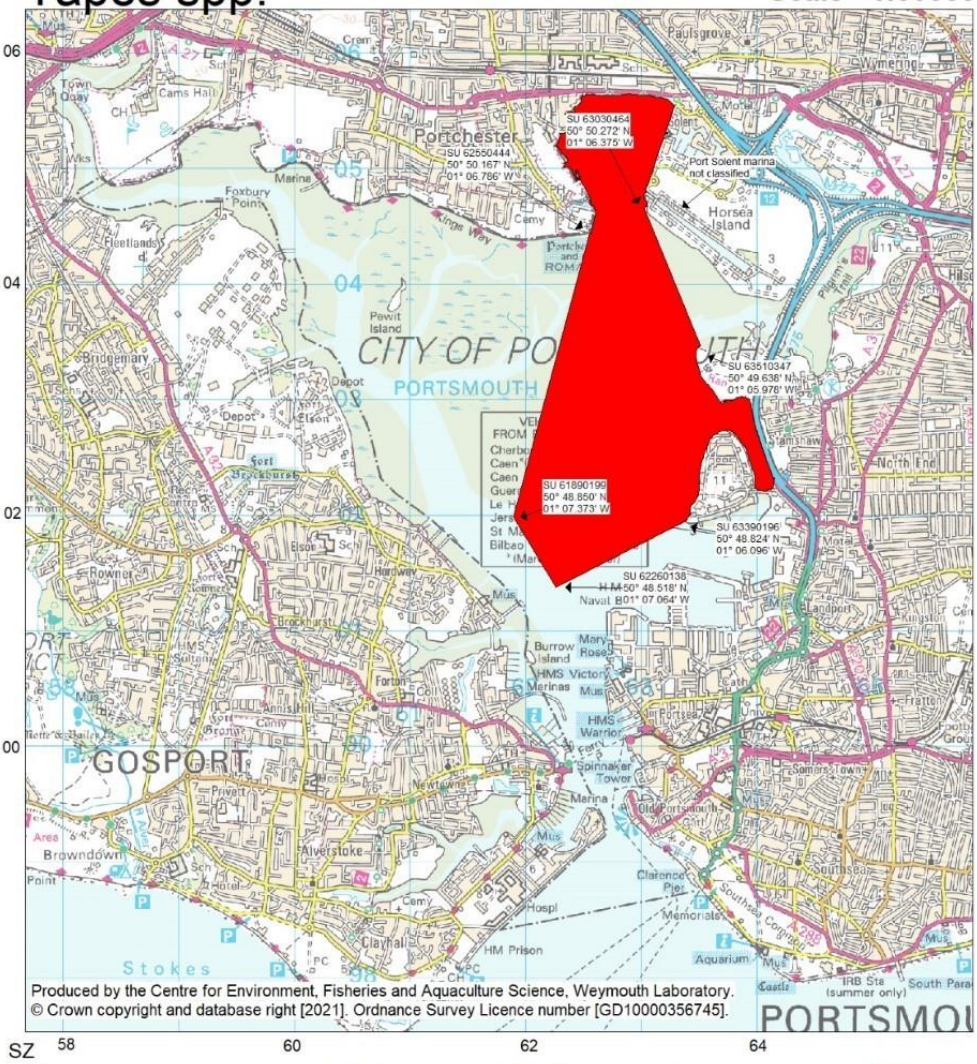
Further details on the classified species and the areas may be obtained from the responsible Food Authority. Enquiries regarding the maps should be directed to: Shellfish Microbiology, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB.
(Tel: 01305 206600 Fax: 01305 206601)

N.B. Lat/Longs quoted are WGS84
Seperate maps available for O. edulis, C. edule, Tapes spp. and M. mercenaria at Portsmouth Harbour
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.

Food Authority: Portsmouth Port Health Authority

Portsmouth Harbour - Tapes spp.

Scale - 1:50000



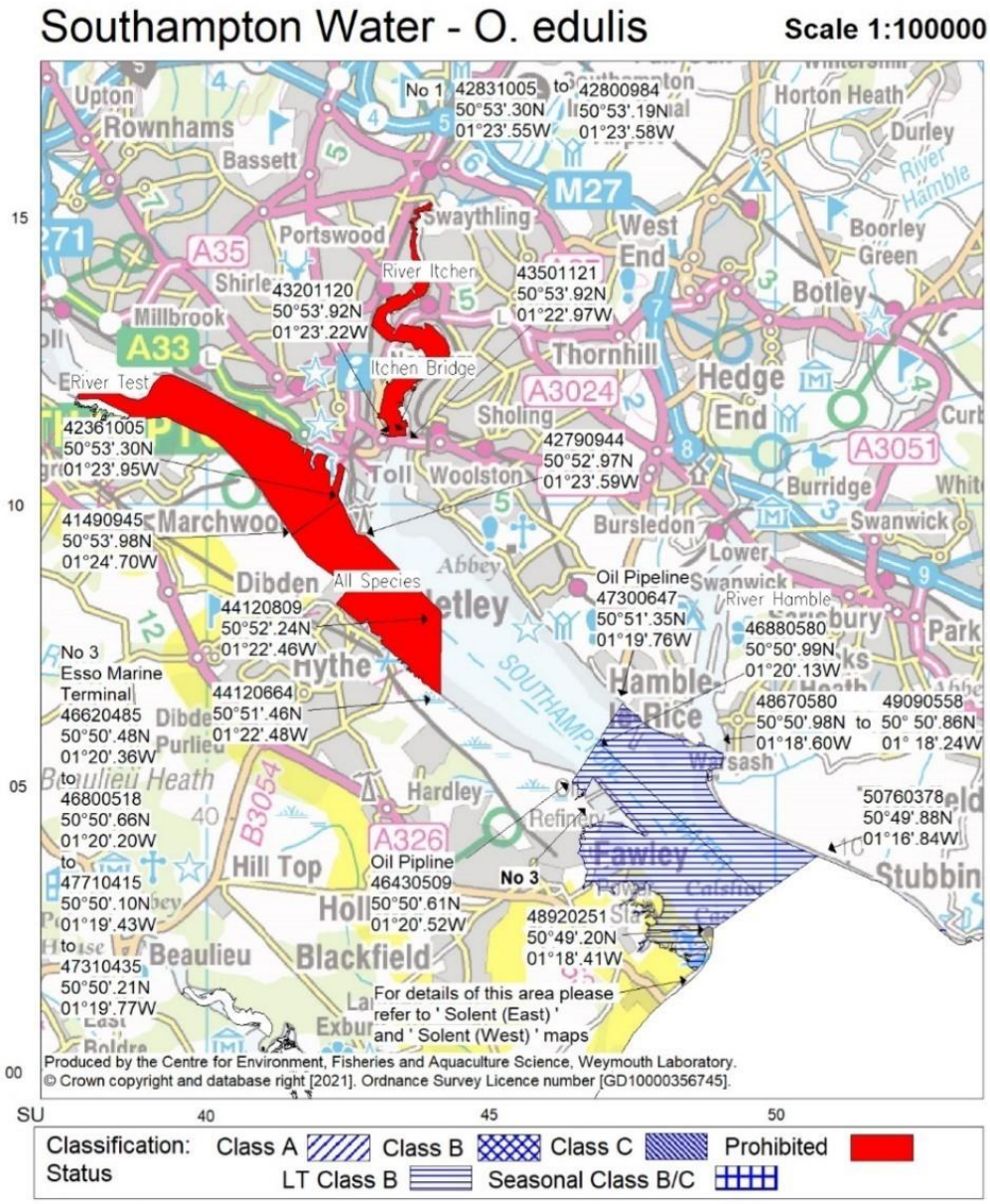
Classification of Bivalve Mollusc Production Areas: Effective from 1 September 2021

The areas delineated above are those classified as bivalve mollusc production areas under Regulation (EU) 2019/627.

Further details on the classified species and the areas may be obtained from the responsible Food Authority. Enquiries regarding the maps should be directed to: Shellfish Microbiology, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB.
(Tel: 01305 206600 Fax: 01305 206601)

N.B. Lat/Longs quoted are WGS84
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.
Separate maps available for M mercenaria and C. edule at Portsmouth Harbour

Food Authority: Portsmouth Port Health Authority



Classification of Bivalve Mollusc Production Areas: Effective from 01 September 2021

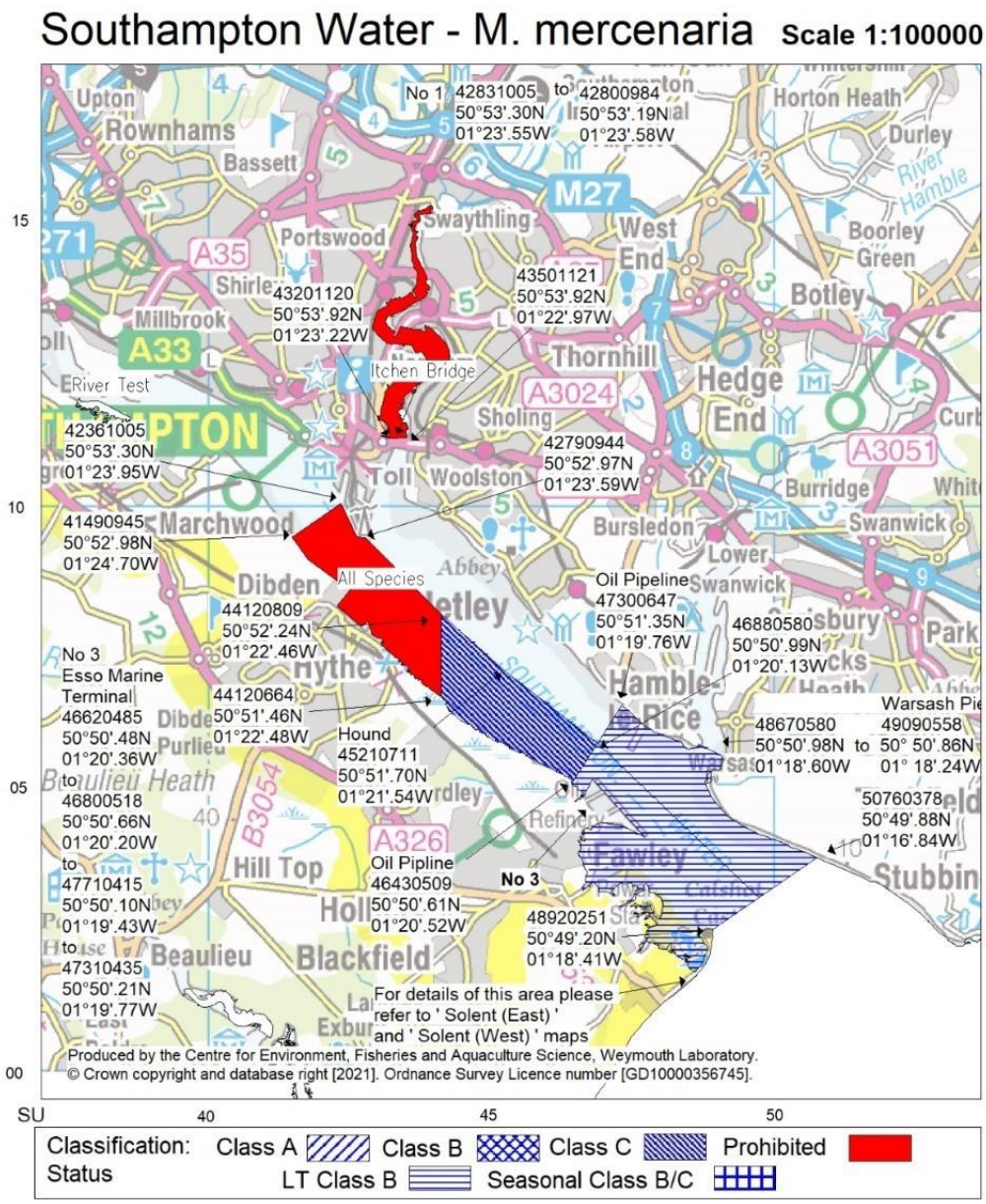
The areas delineated above are those classified as bivalve mollusc production areas under Regulation (EU) 2019/627.

Further details on the classified species and the areas may be obtained from the responsible Food Authority. Enquiries regarding the maps should be directed to: Shellfish Microbiology, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB.
(Tel: 01305 206600 Fax: 01305 206601)

N.B. No harvesting is permitted from Prohibited or unclassified areas
i.e. areas that are not shaded to denote class A, B, LT B or C

Lat/Longs quoted are WGS84
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.
Separate map available for M. mercenaria & Tapes spp. at Southampton Water

Food Authority: Southampton Port Health Authority



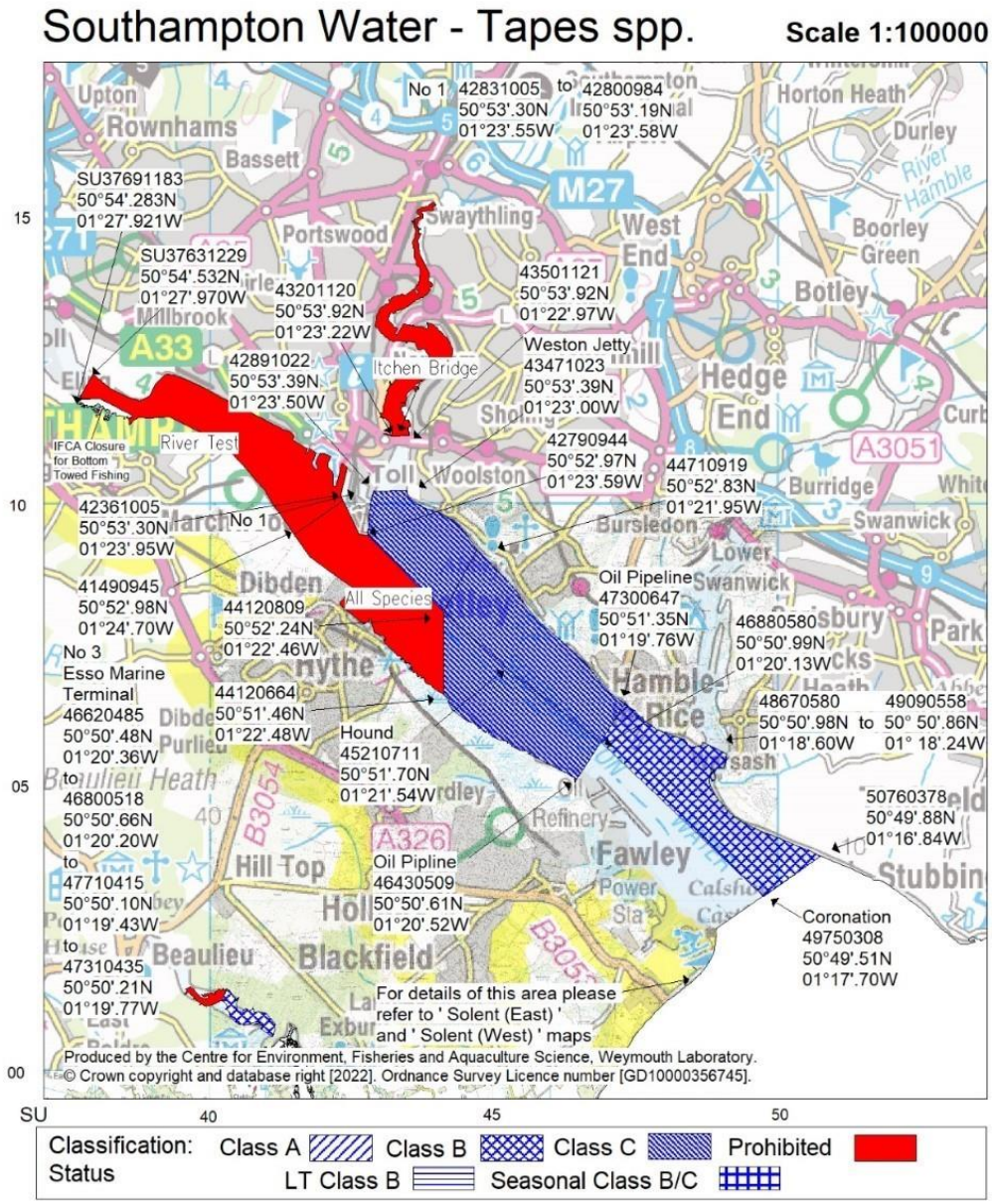
Classification of Bivalve Mollusc Production Areas: Effective from 01 September 2021

The areas delineated above are those classified as bivalve mollusc production areas under Regulation (EU) 2019/627.

Further details on the classified species and the areas may be obtained from the responsible Food Authority. Enquiries regarding the maps should be directed to: Shellfish Microbiology, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB.
(Tel: 01305 206600 Fax: 01305 206601)

N.B. No harvesting is permitted from Prohibited or unclassified areas
i.e. areas that are not shaded to denote class A, B, LT B or C
Lat/Longs quoted are WGS84
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.
Separate map available for O. edulis and Tapes spp. at Southampton Water

Food Authority: Southampton Port Health Authority



Classification of Bivalve Mollusc Production Areas: Effective from 4 April 2022

The areas delineated above are those classified as bivalve mollusc production areas under Regulation (EU) 2019/627.

Further details on the classified species and the areas may be obtained from the responsible Food Authority. Enquiries regarding the maps should be directed to: Shellfish Microbiology, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB.
(Tel: 01305 206600 Fax: 01305 206601)

N.B. No harvesting is permitted from Prohibited or unclassified areas
i.e. areas that are not shaded to denote class A, B, LT B or C
Lat/Longs quoted are WGS84
Unless otherwise stated, non-straight line boundaries between co-ordinates follow the OS 1:25,000 mean high water line.
Separate map available for O. edulis and M. mercenaria at Southampton Water

Food Authority: Southampton Port Health Authority

Appendix 9-3 Designated sites identified within study areas 1 and 2

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
Solent Maritime Special Area of Conservation (SAC)	Statutory designation/ National Site Network Site	LSO discharge point is located within this designated site	Primarily designated for the following qualifying Annex I habitats under The Conservation of Habitats and Species Regulations 2017 (as amended): Estuaries Spartina swards (*Spartinion maritimae*) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Also hosts other qualifying Annex I habitats which were not the primary reason for selection though do form part of the designated features. These comprise: Sandbanks which are slightly covered by sea water all the time Mudflats and sandflats not covered by seawater at low tide Coastal lagoons Annual vegetation of drift lines Perennial vegetation of stony banks *Salicornia* and other annuals colonizing mud and sand Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") In addition, other non-primarily selected qualifying Annex II species that form part of the designated features includes Desmoulin's whorl snail (*Vertigo moulinsiana*).	**This area is 112.43km^2 and is designated for important Annex I habitats, including estuaries, Spartina swards and Atlantic salt meadows.** **The Solent encompasses a major estuarine system with four coastal plain estuaries and four bar-built estuaries. This area is unique as it has four tides. Sediment habitats within the estuaries include extensive estuarine flats, often with intertidal areas supporting eelgrass (*Zostera spp*.), green algae, sand and shingle spits. The mudflats support rare sponges in the Yar estuary and a sandy reef of *Sabellaria spinulosa* at the eastern side of Chichester Harbour.** **Solent Maritime is the only site for smooth cord-grass *Spartina alterniflora* in the UK and one of two sites where there is significant amounts of small cord grass *S.maritima* are found. Furthermore, this site is one of a few sites for Townsend's cord-grass *S. x townsendii* and extensive areas of common cord-grass *Spartina anglica*.** **The Solent contains the second largest aggregation of Atlantic salt meadows in the south of England. These salt meadows are notable for being representative of ungrazed and support a range of communities including sea-purslane (*Atriplex portulacoides*), common sea lavender (*Limonium vulgare*) and thrift (*Armeria maritima*).** **Other habitats that are present include sandbanks, mudflats and sandflats, coastal lagoons, annual vegetation of drift lines, perennial vegetation of stony banks, *Salicornia* and other annuals colonising mud and sand and shifting dunes with *Ammophila arenaria*.** **Solent maritime is also known to have Desmoulin's whorl snail (*V. moulinsiana*), a species which is restricted to calcareous wetlands.**
Chichester and Langstone	Statutory designation/	LSO discharge	This site is designated as it supports the following breeding birds:	**Chichester and Langstone Harbours SPA covers two large, estuarine basins. Urban development surrounds the west of**

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
Harbours Special Protection Areas (SPA)	National Site Network site	point is located within this designated site	Common tern (*Sterna hirundo*) Little tern (*Sterna albifrons*) Sandwich tern (*Sterna sandvicensis*) The site also supports overwintering populations of the following birds: Bar-tailed godwit (*Limosa lapponica*) Curlew (*Numenius arquata*) Dark-bellied Brent goose (*Branta bernicla bernicla*) Dunlin (*Calidris alpina alpina*) Grey plover (*Pluvialis squatarola*) Pintail (*Anas acuta*) Red-breasted merganser (*Mergus serrator*) Redshank (*Tringa tetanus*) Ringed plover (*Charadrius hiaticula*) Sanderling (*Calidris alba*) Shelduck (*Tadorna tadorna*) Shoveler (*Anas clypeata*) Teal (*Anas crecca*) Turnstone (*Arenaria interpres*) Wigeon (*Anas Penelope*) It also qualifies as it supports a significant wading bird population.	**Langstone Harbour, whereas farmland surrounds the majority of Chichester Harbour. Together, with neighbouring Portsmouth Harbour, the area forms one of the most sheltered intertidal areas on the South Coast of England.** **Both Chichester and Langstone Harbours contain extensive intertidal mudflats and sandflats with areas of seagrass beds, saltmarsh, shallow coastal waters, coastal lagoons, coastal grazing marsh and shingle ridges and islands. These habitats support internationally and nationally important numbers of overwintering and breeding bird species.** **At low tide the mudflats are exposed, the water is drained by channels and creeks which meet to form narrow exits into the Solent. The sediments support rich populations of intertidal invertebrates, which provide an important food source for overwintering birds. Several small freshwater streams flow into the harbours; however, these contribute relatively little freshwater input compared to the tidal flows.** **There are more than 300 ha of seagrass beds (*Zostera noltii* and *Zostera marina*) in the SPA which are an important food source for dark-bellied Brent geese [47]. Overwintering birds also feed and roost in the saltmarsh areas, which are dominated by cordgrass (*Spartina*) swards, as well as on coastal grazing marsh.** **The shingle ridges and islands within the site provide important nesting habitat for three species of tern during the summer breeding season. Adult terns use the shallow coastal waters in the harbours and the wider Solent to forage for small fish to feed themselves and their chicks.** **Areas outside the SPA contain important supporting habitats for the birds, including coastal grazing marsh, amenity grassland and agricultural land. Details of these can be found online, in particular via the Solent Wader and Brent Goose Strategy [48].**
Chichester and Langstone Harbour Ramsar	Statutory designation/ National Site Network site	LSO discharge point is located within	This site is designated for the following passage and wintering birds: Black-tailed godwit (*Limosa limosa)* - Passage	**Chichester and Langstone Harbours are large, sheltered estuarine basins comprising extensive mud and sand flats exposed at low tide. The site is of particular significance for over-wintering wildfowl and waders and also a wide range of**

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
		this designated site	Dark-bellied brent goose (*Branta bernicla)* - Wintering Dunlin (*Calidris alpina alpina)* - Wintering Grey plover (*Pluvialis squatarola)* - Wintering Redshank (*Tringa tetanus)* - Passage Ringed plover (*Charadrius hiaticula)* - Passage Shelduck (*Tadorna tadorna)* - Wintering Waterbird assemblage – Wintering It is also designated for the Estuary habitat.	**coastal and transitional habitats supporting important plant and animal communities. The two large estuarine basins are linked by the channel which divides Hayling Island from the main Hampshire coastline. The site includes intertidal mudflats, saltmarsh, sand and shingle spits and sand dunes. The mudflats support beds of seagrass (*Zostera*) and algae (*Enteromorpha*), whilst the lower saltmarsh is dominated by *Spartina anglica*, with a more varied community at higher levels. Although many areas bordering the site have been developed, some grassland and brackish/freshwater marshes with reedbeds remain**
Chichester Harbour SSSI	Statutory designation	LSO discharge point is located within this designated site	This site is designated for breeding birds: Common Tern (*Sterna hirundo*) Little tern (*Sterna albifrons)* Sandwich tern (*Sterna sandvicensis)* Aggregations of non-breeding birds: Bar-tailed Godwit (*Limosa lapponica*) Black-tailed Godwit (*Limosa limosa islandica*) Dark-bellied Brent Goose (*Branta bernicla bernicla*) Curlew (*Numenius arquata*) Dunlin (*Calidris alpina alpina*) Greenshank (*Tringa nebularia*) Grey Plover (*Pluvialis squatarola*) Redshank (*Tringa tetanus*) Ringed Plover (*Charadrius hiaticula*) Sanderling (*Calidris alba*) Shelduck (*Tadorna tadorna*) Teal (*Anas crecca*) It is also designated for: IA - Coastal Geomorphology Invertebrate assemblage MG5 - *Cynosurus cristatus* - Centaurea nigra grassland	**Chichester Harbour is a sheltered estuarine basins joined by a stretch of water that separates Hayling Island from the mainland. This area consists of coastal saltmarshes, seagrass, sand dunes, mudflats and reedbeds.** **This site supports breeding waterbirds including Little tern (*S. albifrons*) and Sandwich tern (*S. sandvicensis*).** **Chichester Harbour has a population of harbour seals which use two significant haul-out sites, one in Langstone Harbour and the other in Chichester Harbour. Both these haul-out sites are used on a daily bases, however Chichester harbour is used by more seals [47].**

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
			S4 - Phragmites australis swamp and reed-beds SD1 - *Rumex crispus* - Glaucium flavum shingle community SD2 - *Honkenya peploides - Cakile maritima* strandline community SD4 - *Elymus farctus ssp*. Boreali-atlanticus foredune community SD6 - *Ammophila arenaria* mobile dune community Sheltered muddy shores (including estuarine muds) SM1 - *Zostera* communities SM14 - *Atriplex portulacoides* saltmarsh SM6 - *Spartina anglica* saltmarsh W10 - *Quercus robur* - Pteridium aquilinum - *Rubus fruticosus* woodland W16 - *Quercus spp.-Betula spp.-Deschampsia flexuosa* woodland	
Langstone Harbour SSSI	Statutory designation	LSO discharge point is located within this designated site	This site is designated for breeding birds: Common Tern (*Sterna hirundo*) Little Tern (*Sterna albifrons*) Sandwich Tern (Sterna sandvicensis) Non breeding birds: Bar-tailed Godwit (*Limosa lapponica*) Dark-bellied Brent Goose (*Branta bernicla bernicla*) Curlew (*Numenius arquata*) Dunlin (*Calidris alpina alpina*) Grey Plover (*Pluvialis squatarola*) Pintail (*Anas acuta*) Red-breasted Merganser (*Mergus serrator*) Redshank (*Tringa tetanus*) Ringed Plover (*Charadrius hiaticula*)	**Langstone Harbour is a sheltered estuarine basins joined by a stretch of water that separates Hayling Island from the mainland. This area consists of coastal saltmarshes, seagrass, sand dunes, mudflats and reedbeds.** **This site supports breeding waterbirds including Little tern (*S. albifrons*) and Sandwich tern (*S. sandvicensis*).**

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
			Sanderling (*Calidris alba*) Shelduck (*Tadorna tadorna*) Shoveler (*Anas clypeata*) Teal (*Anas crecca*) Turnstone (*Arenaria interpres*) Wigeon (*Anas penelope*) Other designations include Invertebrate assemblage MG11 - *Festuca rubra - Agrostis stolonifera - Potentilla anserina* grassland MG13 - *Agrostis stolonifera - Alopecurus geniculatus* grassland MG5 - *Cynosurus cristatus - Centaurea nigra* grassland S26 - *Phragmites australis - Urtica dioica* tall-herb fen S4 - *Phragmites australis* swamp and reed-beds Saline coastal lagoons SD3 - *Matricaria* maritima - *Galium aparine* strandline community Sheltered muddy shores (including estuarine muds) SM1 - *Zostera* communities SM14 - *Atriplex portulacoides* saltmarsh SM16b - *Festuca rubra* saltmarsh *Juncus gerardii* sub-community SM23 - *Spergularia marina - Puccinellia distans* saltmarsh SM24 - *Elytrigia atherica* saltmarsh SM4 - *Spartina maritima* SM6 - *Spartina anglica* saltmarsh SM7 - *Sarcocornia perennis* SM8 - Annual *Salicornia* saltmarsh	

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
			SM9 - *Suaeda maritima* saltmarsh Vascular plant assemblage	
South Wight Maritime SAC	Statutory designation/ National Site Network Site	3km South of the LSO	The site is designated for Annex I habitats: 1170 Reefs 1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts 8330 Submerged or partially submerged sea caves	**South Wight Maritime SAC is 199km² on the south coast of England and represents contrasting Cretaceous hard cliffs, semi-stable soft cliffs, and mobile soft cliffs. The site is also selected on account of its variety of reef types and associated communities, including chalk, limestone, and sandstone reefs.**
Solent & Southampton Water SPA	Statutory designation/ National Site Network Site	4km SW from the LSO	The site is designated as it supports the following breeding birds: Common tern (*Sterna hirundo*) Little tern (*S. albifrons*) Mediterranean gull (*Larus melanocephalus*) Roseate tern (*Sterna dougallii)* Sandwich tern (*Thalasseu sandvicensis*) The site is also designated as it supports the following overwintering birds: Black-tailed godwit (*Limosa limosa islandica)* Dark-bellied brent goose (*Branta bernicla bernicla)* Ringed plover (*Charadrius hiaticula)* Teal (*Anas crecca*) The area also regularly supports at least 20,000 waterfowl.	**The 54km² area extends from Hurst Spit to Hill Head along the south coast of Hampshire, and from Yarmouth to Whitecliff Bay along the north coast of the Isle of Wight. The site comprises a series of estuaries and harbours with extensive mudflats and saltmarshes together with adjacent coastal habitats including saline lagoons, shingle beaches, reedbeds, damp woodland and grazing marsh. The mudflats support beds of Enteromorpha spp. and Zostera spp. and have a rich invertebrate fauna that forms the food resource for the estuarine birds. In summer, the site is of importance for breeding seabirds, including gulls and four species of terns. In winter, the SPA holds a large and diverse assemblage of waterbirds.**
Solent and Dorset Coast SPA	Statutory designation/ National Site Network site	LSO discharge point is located within this	This site is designated as it supports the following breeding birds: Common tern (*Sterna hirundo*) Little tern (*S. albifrons*)	**Solent and Dorset Coast SPA is 472.6km² and is designated for three species of tern; Sandwich tern, Common tern and Little tern [47]. The site covers the entirety of the area of the Solent, along with Portsmouth, Langstone and Chichester harbours.**

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
		designated site	Sandwich tern (*Thalasseu sandvicensis*) This site is not designated for any overwintering bird species or other wading bird populations.	**Additionally, this site extends to the coastline of the Isle of Wight.** **The site consists of sea inlets, salt marshes, salt pastures, salt steppes, estuaries, mudflats, sandflats, lagoons and sea cliffs.**
Bembridge Marine Conservation Zone (MCZ)	Statutory designation/ National Site Network site	2.2km from LSO	This site is designated for: Maerl beds Native oyster (*Ostrea edulis*) Peacock's tail (*Padina pavonica*) Seagrass beds Sea-pen and burrowing megafauna communities Sheltered muddy gravels Short snouted seahorse (*Hippocampus hippocampus*) Stalked jellyfish (*Calvadosia campanulata)* Stalked jellyfish (*Haliclystus spp*) Subtidal coarse sediment Subtidal mixed sediments Subtidal mud Subtidal sand	**Located on the east coast of the Isle of Wight, Bembridge MCZ covers an area of 75km^2, stretching from Nettlestone Point in the north to Ventnor in the south. The site follows the mean high water mark along the coast and extends out from the land seawards. The site encompasses the intertidal and subtidal areas extending to the edge of the deep water channel approach into the Eastern Solent.** **The area within Bembridge MCZ is highly diverse and includes a wide range of habitats including intertidal sediments which support the notable algae peacock's tail, Padina pavonica and deep water habitats supporting features such as sea pens and burrowing megafauna. The large areas of subtidal mixed sediments act as a supporting substrate to several important features such as maerl beds.** **Bembridge is the only known site in the region where maerl can be found. Maerl is a fragile, calcareous, red seaweed that forms large mats and provides shelter for many other species. Maerl is highly sensitive to seabed activities and takes a long time to recover from damage. The site also protects important seagrass beds which provide refuge for the short-snouted seahorse along with tiny stalked jellyfish, *Calvadosia campanulata* and *Haliclystus* sp.**
Sinah Common SSSI	Statutory designation	4.2km from LSO	This site is designated for: *Calluna vulgaris - Carex arenaria* heath *Armeria maritima - Cerastium diffusum ssp. diffusum maritime therophyte* community *Atriplex prostrata - Beta vulgaris ssp.* maritima sea-bird cliff community	**The site is notified for its coastal habitats including the following: pioneer shingle vegetation, maritime shingle grassland which includes dry acid grassland and lichen rich acid grassland, mobile dune, semi-fixed dune, dune heath and an associated small area ofsaltmarsh.**

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
			Festuca rubra - Armeria maritima maritime grassland Population of Schedule 8 plant - *Petrorhagia nanteuilii, Childing* Pink *Rumex crispus - Glaucium flavum* shingle community *Ammophila arenaria* mobile dune community *Ammophila arenaria - Festuca rubra* semi-fixed dune community *Atriplex portulacoides* saltmarsh *Festuca rubra* saltmarsh *Puccinellia maritima* sub-community *Juncus maritimus* saltmarsh *Festuca ovina - Agrostis capillaris - Rumex acetosella* grassland *Festuca ovina-Agrostis capillaris-Rumex acetosella* subcom *Cornicularia aculeata-Cladonia arbuscula* Vascular plant assemblage	
Brading Marshes to St Helen's Ledges SSSI	Statutory designation	4.6km from LSO	The site is designated for aggregations of non-breeding birds: Black-tailed Godwit (*Limosa limosa islandica)* Dark-bellied Brent Goose (*Branta bernicla bernicla*) Cormorant (*Phalacrocorax carbo*) Curlew (*Numenius arquata*) Dunlin (*Calidris alpina alpina*) Gadwall (*Mareca strepera*) Grey Plover (*Pluvialis squatarola*) Little Grebe (*Tachybaptus ruficollis*) Redshank (*Tringa tetanus*) Ringed Plover (*Charadrius hiaticula*) Shelduck (*Tadorna tadorna*)	**Bembridge Harbour today has a wide variety of estuarine habitats. These include intertidal mudflats and sandflats of ornithological importance, and sand dunes and shingle pits of geomorphological and biological importance which guard the harbour mouth. Beyond the spits are extensive intertidal sandflats with rocky outcrops, shingle, limestone reefs and ledges forming St Helen's Ledges, and the sheltered shallow waters of Priory Bay. This combination of hard and soft coast features supports a rich flora and marine invertebrate fauna including a number of species at their most easterly locality in the English Channel. A series of lagoons associated with the estuary have a high species diversity and support several rare specialist lagoonal species.** **The intertidal mudflats, sandflats, eelgrass Zostera beds, and shingle, together with Brading Marshes, support large numbers of overwintering wildfowl and waders which form an important**

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
			Shoveler (*Anas clypeata*) Teal (*Anas crecca*) Wigeon (*Anas penelope*) Habitats for assemblages of breeding birds: Lowland damp grasslands Assemblages of breeding birds - Lowland open waters and their margins Other features include: EC - Palaeoentomology FM - Palaeoentomology Invertebrate assemblage Lowland ditch systems M22 - Juncus subnodulosus - Cirsium palustre fen meadow M23 - *Juncus effusus/acutiflorus - Galium palustre* rush pasture MG11 - *Festuca rubra - Agrostis stolonifera - Potentilla anserina* grassland MG5 - *Cynosurus cristatus - Centaurea nigra* grassland Saline coastal lagoons SD1 - *Rumex crispus - Glaucium flavum* shingle community SD12 - Carex arenaria - Festuca ovina - Agrostis capillaris dune grassland SD2 - Cakile maritima-Honkenya peploides strandline community SD4 - Elymus farctus ssp. Boreali-atlanticus foredune community Sheltered muddy shores (including estuarine muds) Sheltered rocky shores (predominately sheltered to very sheltered from wave action)	**component of the internationally important bird populations of The Solent. Brading Marshes is also important for its assemblage of breeding birds.**

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
			SM14 - Atriplex portulacoides saltmarsh SM16a - Festuca rubra saltmarsh Puccinellia maritima sub-community SM18 - Juncus maritimus saltmarsh SM24 - Elytrigia atherica saltmarsh U1 b,c,d,f - Festuca ovina - Agrostis capillaris - Rumex acetosella grassland U2 - Deschampsia flexuosa grassland Vascular plant assemblage W8 - Fraxinus excelsior - Acer campestre - Mercurialis perennis woodland	
Whitecliff Bay and Bembridge Ledges SSSI	Statutory designation	5.1km from LSO	This site is designated for: EC - Palaeogene EC - Tertiary Mammalia EC - Tertiary Palaeobotany MC11 - *Festuca rubra - Daucus carota ssp. gummifer maritime* grassland Moderately exposed rocky shores Moderately exposed sandy shores (with polychaetes and bivalves) Reefs SM1 - *Zostera* communities Soft Maritime Cliff and Slope	**The Whitecliff Bay and Bembridge Ledges SSSI comprises extensive areas of intertidal sand, rock and shingle and includes a series of actively eroding cliffs. Collectively these features comprise the coastline of a broad heathland at the eastern extremity of the Isle of Wight.**
Solent and Southampton Water Ramsar	Statutory designation/ National Site Network site	5.8km from LSO	This site is designated for the following breeding birds: Black-tailed godwit (*Limosa limosa*) Common tern (*Sterna hirundo*) Little tern (*Sternula albifrons*) Roseate tern (*Sterna dougallii*) Sandwich tern (*Thalasseus sandvicensis*) For the designated wintering birds: Dark-bellied brent goose (*Branta bernicla*)	**The area covered extends from Hurst Spit to Gilkicker Point along the south coast of Hampshire and along the north coast of the Isle of Wight. The site comprises of estuaries and adjacent coastal habitats including intertidal flats, saline lagoons, shingle beaches, saltmarsh, reedbeds, damp woodland, and grazing marsh. The diversity of habitats support internationally important numbers of wintering waterfowl, important breeding gull and tern populations and an important assemblage of rare invertebrates and plants.**

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
			Ringed plover (*Charadrius hiaticula*) Teal (*Anas crecca*) Waterbird assemblage And for the following assemblages and habitats: Wetland invertebrate assemblage Wetland plant assemblage Estuary Sheltered channel between island/mainland	**The site is one of the few major sheltered channels between a substantial island and mainland in European waters, exhibiting an unusual strong double tidal flow and has long periods of slack water at high and low tide. It includes many wetland habitats characteristic of the biogeographic region: saline lagoons, saltmarshes, estuaries, intertidal flats, shallow coastal waters, grazing marshes, reedbeds, coastal woodland and rocky boulder reefs.**
Ryde Sands and Wootton Creek SSSI	Statutory designation	5.8km from LSO	This site is designated for non-breeding birds: Sanderling (*Calidris alba*) Other designations include: Moderately exposed sandy shores (with polychaetes and bivalves) Population of Schedule 8 stonewort - *Lamprothamnium papulosum*, Foxtail Stonewort Saline coastal lagoons Sheltered muddy shores (including estuarine muds) SM1 - *Zostera* communities Vascular plant assemblage W8 - *Fraxinus excelsior - Acer campestre - Mercurialis perennis* woodland	**The Ryde Sands and Wootton Creek SSSI extends some 10 kilometres along the sheltered north-eastern shore of the Isle of Wight between Fishbourne and Horestone Point. At low water a particularly wide range of intertidal sediments are exposed over this stretch of coastline, grading from the fine estuarine muds of Wootton Creek, through cobbles and boulders at Pelhamfield to the extensive sandflats at Ryde which reach a maximum width of almost 2 kilometres. These sandflats are the most extensive in the Solent and support the richest assemblage of sandy shore marine flora and fauna on the central south coast of Britain.**
Gilkicker Lagoon SSSI	Statutory designation	7.3km from LSO	Population of red data book stonewort - *Lamprothamnium papulosum,* Foxtail Stonewort Population of Schedule 5 crustacean - *Gammarus insensibilis*, Lagoon Sand Shrimp Population of Schedule 5 sea anemone - *Nematostella vectensis*, Starlet Sea Anemone Saline coastal lagoons	**Gilkicker Lagoon represents a rare habitat in Britain, where there are relatively few saline lagoons. It is a relict of a former defensive moat which in turn is thought to have been partially derived from an ancient fleet extending parallel and to the rear of the apposition beach of Gilkicker Point. The Lagoon is linked to the sea by an intake through the shingle beach separating it from the sea. It usually maintains a salinity comparable to that of the sea water in the Solent. Saline lagoons characteristically experience large variations in water chemistry and other environmental parameters, and thus support a specialised flora and fauna.**

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
Portsmouth Harbour SPA	Statutory designation/ National Site Network site	7.6km northwest of LSO discharge point location	This site is designated as it supports the following overwintering birds: Black-tailed Godwit (*Limosa limosa islandica*) Dark-bellied brent goose (*B. b. bernicla)* Dunlin (*C. a. alpina*) Red-brested merganser (*M. serrator*) This site is not designated for any breeding bird species or other wading bird populations.	**Portsmouth Harbour is composed of intertidal mudflats and sandflats with seagrass beds, areas of salt marsh, coastal lagoons and coastal grazing marsh. There is approximately 0.77km² of seagrass beds, comprised of *Zostera marina* and *Zostera noltii* [48].** **The area is designated for non-breeding birds including black-tailed godwit (*L. l. islandica*), dark-bellied brent goose (*B. b. bernicla),* Dunlin (*C. a. alpina*) and Red-breasted merganser (*M. serrator*)**
Portsmouth Harbour Ramsar	Statutory designation/ National Site Network site	7.6km northwest of LSO discharge point location	Assemblage of wintering birds associated with intertidal habitats: Black-tailed godwit*, Limosa limosa* Dark-bellied brent goose, *Branta bernicla* Dunlin, *Calidris alpina* Red-breasted merganser, *Mergus serrator*	**Portsmouth Harbour is composed of intertidal mudflats and sandflats with seagrass beds, areas of salt marsh, coastal lagoons and coastal grazing marsh. There is approximately 0.77km² of seagrass beds, comprised of *Zostera marina* and *Zostera noltii*** *Error! Bookmark not defined.***.**
Portsmouth Harbour SSSI	Statutory designation	7.6km northwest of LSO discharge point location	This site is designated for aggregations of non-breeding birds: Black-tailed Godwit (*Limosa limosa islandica*) Dark-bellied Brent Goose (*Branta bernicla bernicla*) Dunlin (*Calidris alpina alpina*) Grey Plover (*Pluvialis squatarola*) Other designated features include: CG2 - *Festuca ovina - Avenula pratensis* lowland calcareous grassland Population of Schedule 5 crustacean - *Gammarus insensibilis,* Lagoon Sand Shrimp Population of Schedule 5 sea anemone - *Nematostella vectensis*, Starlet Sea Anemone SM13a - *Puccinellia maritima* saltmarsh, *Puccinellia maritima* dominant sub-community SM14 - *Atriplex portulacoides* saltmarsh SM15 - *Juncus maritimus - Triglochin maritima* saltmarsh	**Portsmouth Harbour is composed of intertidal mudflats and sandflats with seagrass beds, areas of salt marsh, coastal lagoons and coastal grazing marsh. There is approximately 0.77km² of seagrass beds, comprised of *Zostera marina* and *Zostera noltii*** *Error! Bookmark not defined.***.**

Site	Valuation	Approximate Distance and Direction from the LSO (km)	Designated Features	Description of Site
			SM16a - *Festuca rubra* saltmarsh *Puccinellia maritima* sub-community SM6 - *Spartina anglica* saltmarsh Vascular plant assemblage	

Source: Designated Sites View [52].

Appendix 9-4 Baseline for commercially sensitive species

Introduction

1.12.1 The following section describes the sensitivity of each commercially targeted species with regard to habitat preference, foraging behaviours and reproductive patterns when considering potential modifications in water chemistry from the Proposed Development for each of the species identified. In most cases a concurrent list of species can be found within both the economic value and landed catch columns for each rectangle, albeit in different orders due to differences in price per kilo attained for individual target species.

Bivalve mollusc production area species

1.12.2 European oyster (O. edulis), Pacific oyster (C. gigas), Hard clam (Mercenaria Spp.), Manila clam (R. philippinarum) and Common cockle (C. edule) are cultivated within Langstone, Chichester and Portsmouth harbours, and the Solent, all of which are located within the boundaries of ICES rectangles 30E8 and 30E9. Due to similarities in their life cycle stages, sessile nature and filter feeding mechanisms, these species have been described together in this section. Where differences exist, in relation to potential modifications to water quality from the Project, these have been specifically addressed for the relevant species. Water quality, in terms of the bacteria and viruses, affects the incidence of microbial contamination in shellfish. As filter feeders, bivalves can also accumulate biotoxins if certain types of phytoplankton are present in the water column. Therefore, there are specific hygiene requirements in order to ensure the safety of bivalve molluscs. These ensure that the risks posed by microbiological contamination and biotoxins are reduced to an absolute minimum. The most important viral hazards associated with the consumption of bivalve molluscs are acquired from human faecal pollution of bivalve production areas, resulting in the temporary closure of bivalve production areas. Due to the sessile nature of filter feeding species that are cultivated within the study area they have the potential to be affected by any modifications to water quality as a result of the intended discharge from LOS. This can be further exacerbated by habitat modifications from increased nutrient loading, with changes to species assemblage within the cultivation areas competing for the availability of space and resources, with the potential for smothering by algal/floral species and eutrophication effects if the natural balance of the ecosystem changes. These species bio-accumulate; therefore, any impacts may not be immediately visible but can accumulate over time.

Whelks (B. Undatum)

1.12.3 Buccinum undatum, commonly known as whelk, are large marine gastropods with a wide distribution range across the North Atlantic Ocean. Whelk commonly inhabit the entire UK coastline, from intertidal areas to depths of more than 1200m where they can be found in various benthic substrates including gravel, sand and mud [49]. Movement is limited once individuals reach maturity, with an upper limit of

155m of daily movement [50] resulting in discrete localised populations. The timing of the reproductive cycle for whelk varies depending on geographical distribution and is temperature dependent. In UK waters mating is triggered when temperatures fall below at least 12°C, in some cases 9°C as has been evidenced for populations found in the Solent. In the Solent whelks were found to lay eggs between December and February [49]. Recruitment is low within the species, despite the large numbers of eggs in an egg mass. Studies on a Solent whelk population found approximately 1% of eggs developed to juveniles and the remaining eggs are used as nurse eggs for the developed embryos. Size of Maturity (SOM) for whelk varies greatly between populations on a small geographical scale. A range of anthropogenic and environmental pressures have been attributed to variations in SOM for whelks including water temperature, depth, fishing pressure, food availability and predation. Whelk populations can be susceptible to modifications in water quality, due to limited mobility of 155m daily, meaning they cannot readily flee from habitats that become temporarily unsuitable. They also have a high dependency on water temperature cues to induce mating and very low recruitment to the fishery.

Sole (S. solea)

1.12.4 Solea solea, commonly known as the common sole is widely distributed in UK waters and inhabits sandy and muddy sediments from 10-100m in depth. Juveniles can be found at depths of 1m in intertidal pools and on sandy shores. The spawning season in the English Channel starts when temperatures rise above 7°C and takes place from late February until the end of June in depths between 40-50 m, peaking in April and May and largely driven by changes in temperature. Several spawning sites have been identified along the south coast including between Beachy Head and the Isle of Wight, to the west of the Isle of Wight and further west of the Channel around Hurd Deep. Once hatched, larvae float at the surface, remaining pelagic for up to 6 weeks before moving towards inshore nurseries. As juveniles, individuals inhabit estuaries, tidal inlets, and shallow, sandy shores. Smaller individuals are found in deeper areas of estuaries whereas larger juveniles of 1 year move with the tides onto mudflats. Juveniles remain in estuaries for approximately two years before moving to deeper water. Adults undertake short migrations between offshore areas and shallower spawning grounds, returning to the spawning ground that they were born at each year [51]. Adult sole are highly mobile and can flee from environments where water modifications have made the area temporarily unsuitable, however pelagic larvae, and juvenile sole are more dependent on estuaries, tidal inlets, and shallow, sandy shores, moving to mudflats after 1 year and into deeper water at 2 years. This time period is critical for the species and may be influenced by modifications to water quality in the study area.

Manilla Clam (R. philippinarum)

1.12.5 Ruditapes phillippinarum, commonly known as the Manila clam, is native to the Indo Pacific region, however through a mix of deliberate and accidental introductions the species is now widely distributed along the Atlantic coast of Europe. Following their introduction, they quickly became a self-sustaining population and were first recorded in the Solent in 2005. Environmental conditions in Poole harbour and the Solent are similar to those of the species native range,

providing a relatively sheltered, nutrient rich, shallow water habitat with extensive intertidal mud flats, and temperatures up to 27°C in the summer, providing optimum reproductive conditions. Manila clams inhabit fine sand and mud sediments in the intertidal zone residing in the top 4 cm of the substratum, but can bury as deep as 10 cm, filtering phytoplankton and sedimentary organic matter from the water. The manila clam is a highly fecund species that becomes sexually mature at an early age and displays an extended spawning season. In the Solent spawning takes place from May to September with a peak between June and August [51]. Due to the sessile nature of these filter feeding species within the study area, they have the potential to be affected by any modifications to water quality as a result of the intended discharge from the Sandow LSO. This can be further exacerbated by habitat modifications from increased nutrient loading, with changes to species assemblage leading to increased competition for the availability of space and resources, with the potential for smothering by algal/floral species and eutrophication effects if the natural balance of the ecosystem changes. These species bio-accumulate; therefore, any impacts may not be immediately visible but can accumulate over time.

Lobsters (H. gammarus)

1.12.6 Homarus gammarus, commonly known as the European lobster is widely distributed in the coastal waters of the northeast Atlantic and inhabits rocky habitats in intertidal areas up to 200m, where boulders and crevices provide shelter from predation and foraging opportunities [52]. Female lobsters display a two-year reproductive cycle. Copulation occurs in the summer months and fertilised eggs are secreted onto the pleopods setae underneath the abdomen. Berried (egg-bearing) females appear from September to December. Eggs then develop over winter in response to water temperature, day length and photoperiodic experience and hatch from May to July. Upon release larvae enter the water column and remain planktonic for the first three larval stages. The fourth stage is referred to as the metamorphosis moult and become the first post larval stage [51]. At this stage they are active, contributing to further dispersal before settling into benthic habitats. Unlike brown crabs, lobsters do not undertake regular migrations instead they move randomly based on limiting environmental factors [52]. Tagging studies have highlighted the limited scale of movement displayed by lobsters with the majority moving less than 4 km over several years. Lobster populations can be susceptible to modifications in water quality, due to limited mobility, meaning they cannot readily flee from habitats that become temporarily unsuitable, high dependency on water temperature cues to induce mating, very low recruitment to the fishery and specific habitat requirements as adult individuals.

Bass (D. labrax)

1.12.7 Dicentrarchus labrax, commonly known as European seabass inhabit shallow coastal and estuarine habitats, favouring rocky reefs and sand banks. Bass begin spawning in the mid-western channel from February, gradually moving eastwards as water temperatures increase [53] Bass spawn in the coastal waters between the Isle of Wight and Beachy Head from May onwards. Once hatched, the pelagic larvae move inshore over a 2–3-month period. Once larvae reach 15mm, they actively swim into estuaries and brackish water and remain in these habitats for 2

years. Adult bass demonstrate strong site fidelity, returning to the same spawning/foraging grounds year after year [51]. Bass is the second most expensive commercial species caught in the Northeast Atlantic after the European Lobster. It is an important target species within the study area and is mainly caught by hook and lines using handlines and pole-lines. Adult bass are highly mobile and can flee from environments where water modifications have made the area temporarily unsuitable, however pelagic larvae drift with currents, and juveniles are more dependent on estuaries and tidal inlets inshore before maturing and heading to deeper water. This time period is critical for the species and may be influenced by modifications to water quality in the study area.

Brown/ Edible Crabs (C. pagurus)

1.12.8 Cancer pagurus, commonly known as the brown or edible crab, is broadly distributed along all British coasts. The species inhabits a broad range of habitats from intertidal areas to depths of 100 m including rocky substrates, coarse sediments, boulders and sandy or muddy seabed habitats [52]. In the English Channel brown crab mate during late spring. Eggs are brooded for 7 to 9 months, during this period females are inactive and do not feed, remaining in sheltered habitat for protection. Hunter et al., (2013) [50] attached tags to 128 mature female crabs across different locations in the English Channel. They found westerly offshore crabs commenced brooding in late October whilst eastern Channel crabs tended to start brooding slightly later in mid to late November. Larvae hatch from March onwards with peak sightings recorded in the plankton between May and July. The larvae are planktonic for 60-90 days before settling on hard substrates in the intertidal zone. Juveniles remain in shallow, rocky habitat for 3 years until they reach a carapace width of 60-70 mm, at which point they migrate to subtidal areas. Brown crab populations can be susceptible to modifications in water quality, due to limited mobility, meaning they can’t readily flee from habitats that become temporarily unsuitable, high dependency on water temperature cues to induce mating, low recruitment to the fishery and specific habitat requirements as adult individuals.

Scallops (Pectinidae spp)

1.12.9 Scallops are a filter-feeding bivalve species which inhabit fine sand and gravel habitats from the sublittoral zone up to depths of 100m. As sessile filter feeders, they sift plankton and organic detritus from the water column [56]. Adults are hermaphroditic and begin to spawn into the water column from around 3 years old. The larvae stay in the water column until they have metamorphosed into spat which then attach for a short period to material such as seaweeds, then detaching and moving to their preferred habitat. Due to the sessile nature of these filter feeding species, they have the potential to be affected by any modifications to water quality as a result of the intended discharge from LOS. This can be further exacerbated by habitat modifications from increased nutrient loading, with changes to species assemblage leading to increased competition for the availability of space and resources, with the potential for smothering by algal/floral species and eutrophication effects if the natural balance of the ecosystem changes. These species bio-accumulate; therefore, any impacts may not be immediately visible but can accumulate over time.

Cuttlefish (S. officinalis) and Squid (L. vulgaris)

1.12.10 Both cuttlefish and squid, along with nautilus and octopus, make up the group known as cephalopods. All species in this group have tentacles attached to their head. Foraging and life cycle traits are broadly similar across the group due to alignments in their anatomy and reproductive capacity. Cuttlefish and squid are demersal species, typically inhabiting moderately warm, shallow coastal waters with sand and mud substrates in the shallow sublittoral up to depths of 200m [56]. Adults are highly mobile and can flee from environments where water modifications have made the area temporarily unsuitable, however juveniles are dependent on shallow inshore nurseries before moving offshore once they have matured. This time period is critical for the species and may be influenced by modifications to water quality in the study area.

Plaice (P. platessa)

1.12.11 Pleuronectes platessa, commonly known as plaice, are a bottom dwelling species found most abundantly on sandy bottoms, but it can also occupy mud and gravel substrates to depths of up to 200m. Plaice spawn offshore throughout the central English Channel at depths ranging from 38 m to 67 m between late November and March [51]. After spawning the eggs initially float on the surface before sinking and hatching in 10 to 12 days depending on temperature. The pelagic larvae drift on tidal currents until they are ready to undergo metamorphosis. After metamorphosis the post larvae resemble miniature plaice and settle on sandy, shallow, inshore nursery grounds. Juveniles remain in shallow nurseries for the first few years of their live before moving to deeper water once they are around 25 cm in length [51]. Adult plaice are highly mobile and can flee from environments where water modifications have made the area temporarily unsuitable, however pelagic larvae, and juveniles are dependent on shallow, sandy inshore nurseries. This time period is critical for the species and may be influenced by modifications to water quality in the study area.

Horse Mackerel (T. trachurus)

1.12.12 Horse mackerel is a pelagic coastal species that inhabits continental shelves and over sandy substrates at depths of up to 200m and is widely distributed throughout the English Channel [58]. It is a migratory species, moving northwards in the summer months and returning southwards when the sea temperature starts to fall. In the northeast Atlantic two stocks are recognised, the western stock spawns in a wide area from Ireland to the Bay of Biscay in the early Spring and moves northward to the southern coasts of Norway and the northern North Sea in the summer. The North Sea stock spawns in the southern part of the North Sea during the summer and then migrates northwards into the central North Sea. Spawning occurs irregularly during the summer from June to August reaching its peak in July. Due to the preferred pelagic environment of Horse Mackerel, it is unlikely that modifications to water quality in the study area will affect the species at any of its life stages as there is limited dependency on inshore nursery areas at the larval/juvenile stage. Adults are highly mobile and can flee from environments where water modifications have made the area temporarily unsuitable.

Lesser Spotted Dog (S. canicula)

1.12.13 Scyliorhinus canicular, commonly known as the lesser spotted dogfish are widely distributed across the Eastern North Atlantic and around the British Isles, and the dominant shark species within the English Channel. Lesser spotted dogfish are bottom-living sharks that occur in depths of up to 400 m but are usually found no deeper than 100 m on sandy, gravelly or muddy seabed habitats. The lesser spotted dogfish is an oviparous (egg laying) species and fertilisation takes place internally. Reproduction occurs year-round. Egg cases are laid in pairs and attached to fixed structures on the seabed such as kelp holdfasts and sessile organisms. Females can lay eggs throughout the year, but peak activity occurs between May and July. Few eggs are laid between August and October. Juveniles remain in shallow water until they mature at which point, they move offshore to deeper water [51]. Adults are highly mobile and can flee from environments where water modifications have made the area temporarily unsuitable, however juveniles are dependent on shallow inshore nurseries before moving offshore once they have matured. This time period is critical for the species and may be influenced by modifications to water quality in the study area.

Herring (C. harengus)

1.12.14 Clupea harengus, commonly known as herring are a pelagic fish, inhabiting northeast Atlantic waters up to depths of 400m. Herring spawning areas are limited by the need for a gravel substrate to which the eggs attach [56]. Depending on water temperature, larvae hatch on the seabed from 8 to 40 days after spawning and drift passively as plankton for the following 4 to 6 months. Young herring remain in nursery areas for 2 years, in shallow nutrient-rich water. The abundance of juveniles in the different nursery areas is dictated by annual variations in the strength and direction of the drift of the larvae and their variable mortality on route. After two years, they swim to deeper waters, spending daytime in deeper water and migrating to shallower waters at night. Although a pelagic species as adults, Herring depend on shallow nutrient-rich nursery water until maturing and heading offshore after 2 years. This time period is critical for the species and may be influenced by modifications to water quality in the study area.

Red Mullet (M. surmuletus) and Mullet (M. cephalus)

1.12.15 Mullus surmuletus, commonly known as the red mullet is a demersal fish broadly distributed in the northeastern and central eastern Atlantic, occurring at depths up to 330m over mud, sand or gravel habitats. Breeding takes place in the spring and summer, with spawning occurring in April and May in the Adriatic Sea, at depths between 60 and 70 m. The larvae soon move to shallower depths and are pelagic as are the juveniles at first. At a length of about 5 cm the juveniles move to the coast and become demersal, often congregating in estuaries, and sometimes swimming a short distance upstream. Later they disperse to muddy, sandy or gravelly substrates becoming sexually mature at a length of 10 to 14 cm during their first year of life [60]. Adults are highly mobile and can flee from environments where water modifications have made the area temporarily unsuitable, however juveniles are dependent on shallow inshore nurseries before moving offshore once

they have matured. This time period is critical for the species and may be influenced by modifications to water quality in the study area.

Mackerel (S. scombrus)

1.12.16 Scrombus scrombus, commonly known as Atlantic Mackerel are a fast-swimming pelagic species that are widely distributed around the British Isles usually at depths of less than 200m [57]. The species makes extensive migrations, and there are a variety of hydrographical features such as temperatures as well as the abundance and composition of zooplankton and other prey is likely to affect its distribution. By 3 years old, most mackerel are mature (at a length of approximately 28cm). Females shed their eggs in about twenty separate batches over the course of the spawning season. Mackerel are batch spawners; they spawn mainly in March to July; the eggs and larvae are pelagic. Due to the preferred pelagic environment of Mackerel, it is unlikely that modifications to water quality in the study area will affect the species at any of its life stages as there is no dependency on inshore nursery areas at the larval/juvenile stage. Adults are highly mobile and can flee from environments where water modifications have made the area temporarily unsuitable.

Pouting (Bib) (T. luscus)

1.12.17 Trisopterus luscus, commonly known as pouting (bib) are widely distributed in inshore and coastal waters around the south coast of the British Isles, inhabiting rocky and sandy habitats up to depths of 300m. Pouting are scavengers which feed on the seabed. They forage for any food source they can find with marine worms, shellfish and dead fish all making up their diet. Due to their small size pouting are a source of prey for large species such as cod, bass and conger eels. The species moves inshore to depths of 50m or less to spawn in March to April having matured at 1-2 years old at lengths of 21-25cm [58]. Adults are highly mobile and can flee from environments where water modifications have made the area temporarily unsuitable, however adults are dependent on inshore waters to spawn. This time period is critical for the species and may be influenced by modifications to water quality in the study area.

Tub Gurnards (C. lucerna)

1.12.18 Chelidonichthys lucerne, commonly known as tub gurnards are a bottom-dwelling coastal species of fish and are widely distributed in the Atlantic Ocean at depths of up to 100m. Tub gurnard are found throughout the UK, particularly in the south of the British Isles, in the English Channel. Gurnard move out into deeper water in the winter and generally come into shallower inshore waters in the warmer summer months. Spawning also takes place in the summer while the fish are in inshore waters. Gurnard will feed where there are offshore sandbanks or swim along sandy coastlines looking for gullies or features where sources of food have gathered. Gurnard will feed over mixed ground if food sources are present and can also be found in clean patches of ground among rocky ground. Adults are highly mobile and can flee from environments where water modifications have made the area temporarily unsuitable, however adults are dependent on inshore waters to spawn.

This time period is critical for the species and may be influenced by modifications to water quality in the study area.

Whiting (M. merlangus)

1.12.19 Merlangius merlangus, commonly known as whiting are widely distributed throughout the northeast Atlantic, in particular in the southeast of England and in the English Channel. These fish live primarily in demersal habitats, or habitats along the seafloor. It is a bentho-pelagic species usually found at depths of 30-100m over a variety of substrates including mud, gravel, sand and rock. Whiting is a fast-growing species reaching around 12 inches, and sexual maturity, by their second year. They have a high fecundity compared to other gadoids but with relatively small eggs, females of 30 cm in length can produce up to 400,000 eggs during the spawning season. Spawning takes place at a depth of 20-150 m, the timing of which varies depending on location, and occurs from January-September around UK coasts. Whiting spawn in batches, eggs are pelagic and larvae form part of the plankton until they reach around 10cm in length. Juveniles spend around one year in shallow waters up to 30m deep before migrating to adult feeding grounds after their first year [53]. Adults are highly mobile and can flee from environments where water modifications have made the area temporarily unsuitable, however juveniles are dependent on shallow inshore nurseries before moving offshore once they have matured. This time period is critical for the species and may be influenced by modifications to water quality in the study area.

Black Sea bream (S.cantharus)

1.12.20 Spondyliosoma cantharus, commonly known as black sea bream are widely distributed throughout the Northeast Atlantic, inhabiting rocky and sandy habitats and seagrass beds in depths of up to 300m and are most abundant along the south coast in UK waters. In 2019 black sea bream was designated as a feature of three MCZ in the Southern Inshore Fisheries and Conservation Authorities (IFCA) District: Poole Rocks, Southbourne Rough and Purbeck Coast [51]. Rising sea temperature as a result of climate change is thought to have had a positive on bream stocks in the English Channel as mean annual frequency of the species has increased in line with rising temperatures. In the English Channel adult black bream move inshore to spawn between April and July once water temperatures are between 12-14°C. Juveniles stay in the vicinity of their nest until they reach 7-8 cm in length before dispersing slightly but still remaining in shallow inshore waters for 2-3 years until they reach sexual maturity. Seagrass beds have been identified as key nursery areas for juvenile black bream. Once juveniles recruit into the adult stock they overwinter in deeper water (50-100 m) before migrating inshore in the spring to spawn [51]. As a designated species of three MCZs within close vicinity of the Project, and with consideration to the nature in which the species builds nests as opposed to egg laying in broad suitable substrate types, as seen with other species, black sea bream should be considered as highly sensitive to modifications in water quality within the study area during the spawning period.

Appendix 15.1 Landfill capacity calculations

This appendix presents calculations to determine the future landfill capacity for hazardous, non-hazardous and inert waste, utilising data collated from the Environment Agency [49].

	South East				South West	
	Inert		Non-hazardous		Hazardous	
	Capacity	Annual change %	Capacity	Annual change %	Capacity	Annual change %
2005	13,812	-	95,221	-	2,498	-
2006	15,026	8.79%	79,962	-16.02%	2,487	-0.45%
2007	23,034	53.29%	76,771	-3.99%	2,291	-7.89%
2008	28,378	23.20%	77,297	0.69%	4,169	82.01%
2009	29,077	2.46%	63,611	-17.71%	2,619	-37.18%
2010	29,228	0.52%	72,041	13.25%	2,249	-14.13%
2011	27,888	-4.58%	66,892	-7.15%	2,168	-3.60%
2012	22,200	-20.40%	62,019	-7.28%	2,481	14.44%
2013	19,002	-14.41%	56,825	-8.37%	2,169	-12.58%
2014	21,097	11.03%	53,374	-6.07%	1,905	-12.17%
2015	26,531	25.76%	48,037	-10.00%	1,837	-3.57%
2016	29,795	12.30%	46,624	-2.94%	1,748	-4.84%
2017	29,121	-2.26%	48,160	3.29%	1,480	-15.33%
2018	29,068	-0.18%	43,834	-8.98%	1,692	14.32%
2019	28,525	-1.87%	38,142	-12.99%	1,352	-20.09%
2020	27,174	-4.74%	35,753	-6.26%	1,310	-3.11%
2021	20,084	-26.09%	31740	-11.22%	1,239	-5.42%
Average		**3.93%**		**-6.36%**		**-1.85%**

	Trend Approach	baseline capacity year taken and the average change (for each region calculated separately) since 2005 applied to each year																			
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
		Historic baseline (tonnes)	Historic baseline (tonnes)	Historic baseline (tonnes)	Historic baseline (tonnes)	Historic baseline (tonnes)	Historic baseline (tonnes)	Historic baseline (tonnes)	Historic baseline (tonnes)	Historic baseline (tonnes)	Historic baseline (tonnes)	Historic baseline (tonnes)	Baseline Capacity (tonnes)	Capacity (tonnes)	Capacity (tonnes)	Capacity (tonnes)	Capacity (tonnes)	Capacity (tonnes)	Capacity (tonnes)	Capacity (tonnes)	Capacity (tonnes)	Capacity (tonnes)
South East	Inert	43,842,000	41,832,000	33,300,000	28,503,000	31,645,500	39,796,500	44,692,500	43,681,500	43,602,000	42,787,500	40,761,000	30,126,000	31,309,012	32,538,479	33,816,225	35,144,148	36,524,216	37,958,478	39,449,061	40,998,178	42,608,127
	Non-hazardous	61,234,850	56,858,200	52,716,150	48,301,250	45,367,900	40,831,450	39,630,400	40,936,000	37,258,900	32,420,700	30,390,050	26,979,000	25,263,042	23,656,224	22,151,606	22,260,598	20,916,928	19,654,364	18,468,008	17,353,263	16,305,804
South West	Hazardous	2,249,000	2,168,000	2,481,000	2,169,000	1,905,000	1,837,000	1,748,000	1,480,000	1,692,000	1,352,000	1,310,000	1,239,000	1,216,086	1,193,595	1,171,520	1,149,854	1,128,588	1,107,716	1,087,230	1,067,122	1,047,387

Appendix 18-1 Preliminary hydrogeological impact assessment

1 Introduction

1.1.1 This Preliminary Hydrogeological Impact Assessment (Preliminary HIA) has been prepared on behalf of the Applicant, for the Hampshire Water Transfer and Water Recycling Project (hereby referred to as the Proposed Development), which forms part of the Water for Life Hampshire Programme. This preliminary assessment of hydrogeological risks, based on desktop information, aims to:

- Identify key environmental constraints and opportunities to inform:
  - The next stages of the scheme development at the Environmental Impact Assessment (EIA) stage, and
  - The definition of environmental design principles and mitigation strategy.
- Identify the need for any additional work required to understand the environmental baseline for the purpose of the EIA.

1.1.2 This iteration of the HIA has been prepared to inform design development and stakeholder engagement, and also to support the EIA Scoping Report. The report comprises an initial desk study of the hydrogeological features within 1km of the Scoping Area, together with their importance and sensitivity to potential impacts from the Proposed Development.

1.1.3 The report is based on data already collated for the Proposed Development and, any additional desktop information that it has been possible to collate from publicly available data sources and stakeholders. These sources of data are described within this document.

1.1.4 The Preliminary HIA will be updated as the design is developed, through consultation with stakeholders and as additional site investigation outputs and monitoring data becomes available. Key assumptions at this stage are highlighted in 1.2.12 to 1.2.19.

1.1.5 The Proposed Development Scoping Area is shown in Figure 1.1 and 1.2 within Volume III. The study area is discussed in section 1.2.8.

1.2 Approach

Guidance

1.2.1 There is no specific guidance in relation to assessing the impact of pipelines on the hydrogeological regime, therefore the hydrogeological assessment of the Proposed Development will be carried out in accordance with the Design Manual for Roads and Bridges (DMRB) LA 113 standard. DMRB is considered to be an appropriate methodology because it is designed for assessing the effects of linear schemes. It is also a well-utilised and tested methodology, familiar to statutory consultees.

1.2.2 In particular, DMRB LA 113 Appendix A – Groundwater Levels and Flows will be utilised which follows a stepped approach to assessment:

- Step 1 – Establish regional groundwater body status
- Step 2 – Develop a conceptual model for the study area

- Step 3 – Based on the developed conceptualisation, identify all potential features which are susceptible to groundwater impacts (both flow and level).

1.2.3 DMRB LA 113 Appendix B – Groundwater dependent terrestrial ecosystems (GWDTE) would be utilised for assessment of impacts on GWDTE, following a stepped approach:

- Step 1 – Identify potential linkages
- Step 2 – Assess GWDTE importance
- Step 3 – Assess potential impacts
- Step 4 – Establish risk to GWDTE
- Step 5 – Assessment outcomes and actions.

1.2.4 The methodology for groundwater assessment also incorporates Environment Agency (EA) guidance on hydrogeological impact appraisal for dewatering abstractions:

- Hydrogeological Impact Appraisal for Dewatering Abstractions, Report SC040020/SR1 [50] and
- Hydrogeological Impact Appraisal for Groundwater Abstractions, Report SC040020/SR2 [51].

Scope of assessment

1.2.5 At this stage, the Preliminary HIA is to identify key environmental constraints and opportunities to inform the next stages of the proposed WRP and pipeline design development at the EIA stage, together with identifying the design principles and mitigation strategy.

1.2.6 The assessment also aims to analyse gaps in environmental data and inform further works.

1.2.7 As the Proposed Development design develops, the report will be updated to identify the hydrogeological impacts from the Proposed Development design and ensure appropriate control measures are in place to mitigate impacts. An updated assessment based on the developed design will be provided at both the Preliminary Environmental Information Report and Environmental Statement stages.

Study area

1.2.8 The initial study area for this assessment includes groundwater features within a 1km buffer of the Scoping Area and is based on the ‘source-pathway-receptor’ pollutant linkage principle. This study area would be extended as appropriate where features or impacts are likely to be impacted at greater distance (e.g., karst features). The Havant Thicket Reservoir has not been included in the Preliminary HIA at this stage, as no intrusive construction works are proposed, and the impacts of the Havant Thicket Reservoir have been considered previously by others.

1.2.9 The study area is to be confirmed with stakeholders and would be reviewed as the assessment is undertaken and the design progresses to ensure sensitive receptors at risk of impact are appropriately captured.

Data sources

1.2.10 This desk study is based on data and information gathered from the following data sources:

Table 1-1: Data sources and date accessed/received

Data source	Date Received/ Last Accessed	Contents
British Geological Society (BGS) GeoIndex	12th August 2022	1:50,000 Scale Geological Mapping Historic Borehole Logs
Department for Environment, Food and Rural Affairs (Defra) Magic Map	12th August 2022	Source Protection Zones (SPZs) Aquifer Designation Mapping Groundwater Vulnerability Mapping Statutory and non-statutory designated sites (Sites of Special Scientific Interest, Special Areas of Conservation, SPA and Ramsar sites)
EA Abstraction Licensing Strategies (CAMS process) Collection	12th August 2022	East Hampshire Abstraction Licensing Strategy (2019) Test and Itchen Abstraction Licensing Strategy (2019)
EA Catchment Data Explorer	2nd May 2023	WFD water body status objectives and classification data (Cycle 3)
EA GWDTE Data	12th August 2022	Designated Groundwater Dependent Terrestrial Ecosystems (England Sites of Special Scientific Interest Only)
Portsmouth Water Request for Information	2nd August 2022	BGS Commissioned Report CR/19/046 'A review of the hydrogeology of the Bedhampton and Havant Springs Source Protection Zones' 2019 B.A. Hydro Solutions Report 'Portsmouth Water Head Office Redevelopment Hydrogeological Risk Assessment' Nov 2014
Winchester City Council Request for Information	15th July 2022	Unlicensed abstractions within study area (abstractions <20m^3/d which do not require a license from the EA)
Eastleigh Borough Council	16th November 2022	Unlicensed abstractions within study area (abstractions <20m^3/d which do not require a license from the EA)
Havant Borough Council	26th July 2022	Havant Borough Council were contacted in regard to unlicensed abstractions (<20 m^3/day) within the area, but no data was available for the area.
East Hampshire District Council	8th November 2022	East Hampshire District Council were contacted in regard to unlicensed abstractions

Data source	Date Received/ Last Accessed	Contents
		(<20 m^3/day) within the area, but no data was available for the area.
Fareham Borough Council	22nd November 2022	Fareham Council were contacted in regard to unlicensed abstractions (<20 m^3/day) within the area, but no data was available for the area.
Portsmouth City Council	11th November 2022	Portsmouth City Council were contacted in regard to unlicensed abstractions (<20 m^3/day) within the area, but no data was available for the area.
South Downs National Park Authority	20th October 2022	South Downs National Park Authority were contacted in regard to unlicensed abstractions (<20 m^3/day) within the area, but no data was available for the area.
Ordnance Survey	12th August 2022	Maps (including historical) showing location of springs etc.
MetOffice	12th August 2022	Climate Averages Data
EA	8th June 2022	EA Consented Discharges
EA	30th August 2022	Selected groundwater model reports and figures
EA	31st January 2023	EA Regulated Abstractions Groundwater level data Rainfall data
EA	12th August 2022	LIDAR Data [50]

1.2.11 At this stage no site-specific investigation data is available, with several requests for information outstanding (outstanding requests for information noted in Table 1-2)

Assumptions, gaps and limitations

1.2.12 The Preliminary HIA has been collated based on a range of publicly available data and information provided by stakeholders at the time of writing.

1.2.13 However, there is a level of uncertainty associated with their use in this iteration of the report. As an example, the geology along the route has been assumed to be as per the geological maps available from the BGS. Site Investigation works are proposed to inform the ground and groundwater conditions along the route which would need to be incorporated into the updated HIA to support the Environmental Statement.

1.2.14 Data requests have been submitted to several stakeholders for additional data within the area which may assist in conceptualisation of the hydrogeology. Other data has been identified as beneficial and would be requested as the Proposed Development design progresses. Data that has been requested or would be requested in the future is summarised in Table 1-2 below.1

Table 1-2: Additional data requested/to be requested

Baseline Data	Data Requests
Portsmouth Water - Any relevant hydrogeological reports or water feature surveys - Abstraction Data (groundwater + surface water) - Groundwater levels - Groundwater chemistry - Havant Thicket Reservoir Documents (Site Investigations etc)	Ongoing engagement with Portsmouth Water
Southern Water - Any relevant hydrogeological reports or water feature surveys - Surface water levels, flows and chemistry - Groundwater levels - Groundwater chemistry - Any existing/historical site investigation reports	On-going document review and ground investigation
EA - Regional groundwater modelling inc. conceptual and numerical modelling reports	Ongoing engagement
BGS - Karst Database - Groundwater Flooding Susceptibility	Karst database and groundwater flooding susceptibility information to be requested for Preliminary Environmental Information (PEI) Report. Karst features within 10km of preferred corridor to be requested for PEI Report. Groundwater flooding susceptibility information within the scoping boundary is to be requested for PEI Report.

1.2.15 It is assumed that the requested data from stakeholders (documented in Table 1-2) would be made available for future revisions of the HIA and would be accurate. Any data collected would be used to refine the conceptual models in future revisions of the HIA document and would form part of ongoing dialogue with the EA and others.

1.2.16 It is assumed that there will be gaps in data where the information is not readily available, such as the location of springs or unlicensed abstractions (<20 m^3/day) which are not registered with local councils. The design and construction methodology will need to take this into consideration, with appropriate mitigation

[1] Note that some data within Table 1-1 has been received, but not utilised within this report (such as groundwater levels from the EA). The data will be incorporated into future revisions of the HIA).

measures available should additional receptors be encountered/identified during construction.

1.2.17 The assessments would include the information reasonably required to assess potential environmental effects. The assessments would represent a 'reasonable worst-case' and would be based on conservative inputs derived from available field or desk study data and published research literature relevant to the study area. It is acknowledged that uncertainty is inherent to the assessment of interaction between surface water and groundwater. Future ongoing monitoring would be undertaken to validate the design and assessment assumptions.

1.2.18 Due to the complexities of the hydrogeological regime in the study area, it is considered that the Proposed Development cannot be defined in a full scale three-dimensional numerical model sufficiently enough to accurately represent the processes occurring and how they may be affected by the Proposed Development. Analytical and two-dimensional conceptual models would be developed for key assessment areas to ascertain the impacts of the Proposed Development. The requirement for additional 3D modelling in key areas would be reviewed on the completion of initial 2D and analytical assessments.

1.2.19 The design of the Proposed Development and construction methodologies is currently being developed. At this stage of assessment, the following key assumptions are made in relation to the construction methodologies based on preliminary discussions with the design team:

- Any abstractions required for the works would be temporary in nature (e.g. construction dewatering), with no permanent groundwater control operations proposed or required.
- All trenchless pipeline sections would utilise methodologies which exclude groundwater (closed face tunnelling or horizontal directional drilling). Temporary groundwater control would only be required for associated drive and receptions shafts.

2 Baseline information

2.1 Regional understanding

Designations and directives

Catchment Abstraction Management Strategy

2.1.1 The Proposed Development is located within two Catchment Abstraction Management Strategy (CAMS) areas (water resource management boundaries as defined by the EA). The CAMS areas are listed below and illustrated in Figure 18.9 within Volume III:

- Test and Itchen – Western end of the preferred pipeline corridor (west of Lower Upham) [53]
- East Hampshire – The remainder of the preferred pipeline corridor (from Havant to Lower Upham) [54]

2.1.2 The Test and Itchen CAMS covers the Test and Itchen catchments in Hampshire and covers an area in the order of 1,675 km^2. Large portions of the catchments are underlain by chalk which influences the flow regimes and drainage patterns. Many of the tributaries are bournes (intermittent streams flowing from springs) which only flow during high groundwater conditions.

2.1.3 For the groundwater units within the study area of the Proposed Development:

- The groundwater balance for the 'Itchen Chalk' has restricted water available (no new consumptive licenses would be granted);
- The groundwater balance for the 'Central Hants Bracklesham Group' has water available (new licenses would be considered on a case-by-case basis).
- (Note that the Central Hants Lambeth Group is not included within the CAMS)

2.1.4 The East Hampshire catchment covers an area in the order of 517 km^2 consisting of rolling chalk downlands to the north and a heavily urbanised coastal plain to the south. As with the Test and Itchen CAMS, the chalk plays an important role, being an important source of water for many of the streams and wetlands.

2.1.5 The CAMS identifies that for the groundwater units located within the study area of the Proposed Development:

- The groundwater balance for the 'East Hants Chalk' has restricted water available (no new consumptive licenses would be granted).
- The groundwater balance for the 'South East Hants Bracklesham Group' is illustrated as having water available (new licenses will be considered on a case-by-case basis). However, the CAMS notes that '*it is unlikely that there will be any potential for significant, reliable abstractions from these units. There is no specific policy for these aquifers. Decisions about an application will be made on a case-by-case basis'*.
- The 'East Hants Lambeth Group' and 'South Hants Lambeth Group' are illustrated as having restricted water available. However, the CAMS notes that '*it is unlikely that there will be any potential for significant, reliable abstractions*

from these units. There is no specific policy for these aquifers. Decisions about an application will be made on a case-by-case basis'.

Water Framework Directive

2.1.6 The Proposed Development is located over a single River Basin District; the South East River Basin District.

2.1.7 The status and objectives of features are based on those set out in the 2022 River Basin Management Plan (RBMP).

2.1.8 The study area of the Proposed Development crosses seven groundwater bodies. A summary of the WFD groundwater bodies is presented in Table 2-1 and are shown in Figure 18.2 within Volume III.

2.1.9 The superficial deposits are not specifically designated as WFD groundwater bodies. However, it is anticipated that they are hydraulically connected to the relevant underlying designated WFD groundwater bodies.

Table 2-1: WFD groundwater bodies summary [51]

	River Itchen Chalk	East Hants Chalk	Central Hants Bracklesham Group	South East Hants Bracklesham Group	Central Hants Lambeth Group	East Hants Lambeth Group	South Hants Lambeth Group
Groundwater Body ID	GB40701G505000	GB40701G502700	GB40702G500900	GB40702G503000	GB40702G503800	GB40702G500800	GB40702G503700
River Basin District	South East	South East	South East	South East	South East	South East	South East
Current Overall Status	Poor	Poor	Good	Poor	Good	Good	Good
Current Quantitative	Poor	Poor	Good	Good	Good	Good	Good
Current Chemical Status	Poor	Poor	Good	Poor	Good	Good	Good
Quantitative Objective	Good	Good	Good	Good	Good	Good	Good
Chemical Objective	Good	Good	Good	Good	Good	Good	Good
Protected areas	Nitrate Directives, Drinking Water Protected Areas and Safeguard Zones	Nitrate Directives, Drinking Water Protected Areas and Safeguard Zones	Nitrate Directives and Drinking Water Protected Areas	Nitrate Directives and Drinking Water Protected Areas	Nitrate Directives and Drinking Water Protected Areas	Nitrate Directives and Drinking Water Protected Areas	Nitrate Directives and Drinking Water Protected Areas

Aquifer designations

2.1.10 Aquifers within the study area of the preferred pipeline corridor that have been classified by the EA are listed in the following paragraphs and are presented in Figure 18.3 and Figure 18.4 within Volume III.

2.1.11 The various chalk members of the White Chalk Subgroup are designated by the EA as a Principal aquifer. No superficial deposits are designated as principal aquifers. Principal aquifers have high permeability, meaning they usually provide a high level of water storage and transmission, supporting water supply and river base flow on a strategic scale.

2.1.12 The Lambeth Group, Bracklesham Group and sand members of the London Clay (e.g., Durley Member and Bognor Member) together with the River Terrace Deposits and Alluvium superficial deposits are designated by the EA as Secondary A aquifers. This designation indicates that the aquifers are 'permeable layers that can support local water supplies and may form an important source of base flow to rivers'.

2.1.13 No bedrock or superficial deposits are designated by the EA as a Secondary B aquifer. This designation indicates that 'aquifers are mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers'.

2.1.14 No bedrock is designated as a Secondary undifferentiated aquifer, however, Raised Marine Deposits, Beach and Tidal Flats and Head superficial deposits are designated as Secondary undifferentiated. This designation indicates that 'it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value'.

Geology

Superficial deposits

2.1.15 The superficial geology underlying the Proposed Development is presented in Figure 11.3 within Volume III.

2.1.16 Superficial deposits are located intermittently along the preferred pipeline corridor, and comprise of:

- Alluvium
  - Holocene Epoch (0.01Ma – Present). Alluvium is a general term for clay, silt, sand, and gravel. It is the unconsolidated detrital material deposited by a river, stream, or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope. Synonym: alluvial deposits. Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat, and basal gravel. A stronger, desiccated surface zone may be present.
- River Terrace Deposits

- Quaternary Period (2.59Ma – Present). Sands and gravels, locally with lenses of silt, clay or peat.

- Head Deposits
  - Holocene Epoch (0.01Ma – Recent). Head is poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash and soil creep, mantling a hillslope and deposited by solifluction and gelifluction processes. Solifluction is the slow viscous downslope flow of waterlogged soil and other unsorted and unsaturated superficial deposits. The term gelifluction is restricted to the slow flow of fluidized superficial deposits during the thawing of seasonally frozen ground. The flow is initiated by meltwater from thawing ice lenses. Polymict deposit: comprises gravel, sand and clay depending on upslope source and distance from source. Locally with lenses of silt, clay or peat and organic material.
- Raised Marine Deposits
  - Holocene Epoch (0.01Ma – Recent). Raised marine and coastal zone deposits are isostatically uplifted marine and coastal zone deposits which crop out in part above high-water mark. Variable lithology. Gravel (shingle), sand, silt and clay; commonly charged with organic debris (plant and shell).
- Beach and Tidal Flat Deposits
  - Quaternary Period (2.59Ma – Recent). Composite of 'Beach deposits': Shingle, sand, silt, and clay; may be bedded or chaotic; beach deposits may be in the form of dunes, sheets, or banks, and 'Tidal Flat Deposits': commonly silt and clay with sand and gravel layers; possible peat layers; from the tidal zone.
- Clay with Flints
  - Palaeogene Period to Pleistocene Epoch (66.0 – 0.012Ma). A residual deposit formed from the dissolution, decalcification, and cryoturbation of bedrock strata of the Chalk Group and Palaeogene formations and, in the extreme west of the outcrop, the Upper Greensand Formation. It is unbedded and heterogenous. The dominant lithology is orange-brown and red-brown sandy clay with abundant nodules and rounded pebbles of flint. Angular flints are derived from the Chalk, and rounded flints, sand, and clay from Palaeogene formations. There is commonly a discontinuous basal layer up to 10 cm thick, with dark brown to black matrix, stiff, waxy, and fissured, with relatively fresh flint nodules stained black or dark green with manganese or glauconite. The deposit locally includes bodies of yellow fine- to medium- grained sand, reddish brown clayey silt, and sandy clay with beds of well-rounded flint pebbles, derived from Palaeogene formations.

2.1.17 Alluvium and River Terrace Deposits are mapped along the preferred pipeline corridor, primarily in association with surface water bodies and flood zones and are crossed by the Proposed Development in several locations.

2.1.18 Head Deposits are also mapped along the preferred pipeline corridor, primarily corresponding to topographic lows at the base of hills and within valleys and would be crossed by the Proposed Development in several locations.

2.1.19 Raised Marine Deposits and Beach and Tidal Flat Deposits are mapped extensively to the south of the preferred pipeline corridor in association with the

coastline, although are only anticipated to be encountered at surface in the area of the proposed WRP and Budds Farm WTW.

2.1.20 Clay with Flints are primarily mapped north-west of the preferred pipeline corridor within the southern extent of the Chalk Downs. The deposits are only mapped at the north-western extreme of the study area (north-west of Otterbourne).

Bedrock

2.1.21 The bedrock geology underlying the Proposed Development is presented in Figure 11.2 within Volume III.

2.1.22 The Proposed Development is underlain by four main bedrock geological groups, from youngest to oldest:

- Bracklesham Group
  - Ypresian to Lutetian age (56.0 – 41.2Ma). The Bracklesham Group comprises interbedded and interlaminated clays, silts and mostly fine or medium grained sands. Minor coarse grained sands, gravelly sands, gravels, sandstones or ironstone concretions occur in places.
- Thames Group
  - Ypresian Age (56.0Ma - 47.8Ma) mainly silty clays and clays, with occasional silts, sands, gravels, and calcareous mudstones. Includes the London Clay Formation.
- Lambeth Group
  - Thanetian to Ypresian Age (59.2 – 47.8Ma) variable sequences mainly of clay with some sands and gravels, minor limestones and lignites and occasional conglomerates and sandstones. Variable depositional environments including fluvial, estuarine, lagoonal and near-shore marine.
- White Chalk Subgroup
  - Late Cretaceous (100.5 - 66.0Ma) Chalk with discrete marl seams, nodular chalk, sponge-rich and flint seams throughout.

2.1.23 The Bracklesham Group is anticipated to underlie various sections of the Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW.

2.1.24 The Thames Group is anticipated to underlie sections of the Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW and the Proposed Underground Pipeline between the proposed WRP and Havant Thicket Reservoir.

2.1.25 The Lambeth Group is anticipated to sections of the Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW and the Proposed Underground Pipeline between the proposed WRP and Havant Thicket Reservoir.

2.1.26 The White Chalk Subgroup is found to the north-east of the preferred pipeline corridor in the chalk hills of the South Downs and may be encountered below the superficials at the north-western end of the study area (north-west of Otterbourne). The Portsdown anticline also leads to the chalk subgroup being observed directly below the superficials in the area north of Portsmouth (e.g., Portsdown hill) and may be encountered below the superficials along south-eastern sections of the

Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW, as well as the proposed WRP and connecting underground pipelines. Chalk in the Hampshire area is commonly 80-150m thick but can be as thick as 400m where uneroded and confined by Palaeogene deposits.

Structural geology

2.1.27 During the Cenozoic, the region was impacted by direct south to north compression related to the alpine mountain building event in southern Europe. In general, the exposed uplands of chalk to the north are broadly anticlinal in structure, whilst thicker deposits of Paleogene sands, silts and clays are encountered in the Hampshire basin where the chalk forms a syncline.

2.1.28 In the study area, the main geological structures include the Winchester anticline in the South Downs where chalk exposures are encountered, the Chichester syncline where Paleogene deposits are encountered between the two chalk outcrops (e.g., from Horndean to Bedhampton and Havant), the Portsdown anticline to the north of Portsmouth (e.g. the Portsdown Hill chalk ridge) and the Hampshire basin in the south [56].

Hydrogeology

Superficial deposits

2.1.29 Flow through the superficial deposit aquifers is dominated by intergranular flow where the permeability will support it. Groundwater flow through the superficial deposits will be locally variable and limited to more permeable zones.

2.1.30 Superficial deposit aquifers are generally anticipated to be unconfined; however, heterogeneity of deposits means localised confinement of water bearing, coarse grained units is likely.

2.1.31 Alluvium and River Terrace Deposits are present across the Proposed Development, associated with main surface watercourses, and are likely to comprise a mixture of clays, silts, sands, and gravels. Deposits can be complex with interdigitations of deposits which may develop separate piezometric levels, although they are generally anticipated to be permeable. Due to their permeability, the deposits are anticipated to be in continuity with associated surface watercourses and features and the chalk bedrock where they directly overlie. River Terrace Deposits generally comprise less fines than Alluvium and thus will generally be more permeable.

2.1.32 Head, Raised Marine Deposits and Beach and Tidal Flat Deposits are likely to more variable and heterogenous (which results in their Secondary Undifferentiated designation) although high permeability beds may be encountered. Deposits will be complex with interdigitations of deposits which may develop separate piezometric levels.

2.1.33 The Clay with Flints deposits are anticipated to generally have a low permeability with limited water bearing potential.

Bedrock

2.1.34 The chalk bedrock is of hydrogeological significance, providing an important source of supply to public water supply abstractions and surface water features (including environmentally significant chalk streams).

2.1.35 Chalk is generally referred to as a dual porosity aquifer, where main storage of water occurs in the low-transmissivity porous matrix, whilst flow and transport occur primarily in a pervasive high-transmissivity fractures (or solution features) network.

2.1.36 Regional groundwater flow within the chalk bedrock is generally southerly from the elevated chalk hills of the South Downs in the north towards the shallow Langstone Harbour and Solent in the south. The hydraulic heads from the groundwater source in the north result in groundwater flowing beneath the Palaeogene deposits of the Chichester syncline and emerging as springs to the south of the Chichester syncline, as discussed in further detail in the Karst section (section 842.1.45).

2.1.37 The hydrogeology of the Portsdown anticline is less studied but is becoming better understood. Groundwater is considered to generally flow radially from the anticline supplying springs along the north coast of Portsmouth Harbour and springs feeding the River Wallington [57].

2.1.38 Transmissivity and storage coefficient data from the Hampshire area indicates [56]:

- Transmissivities ranging from 0.55 to 29,000 m2/d
- A geometric mean transmissivity of 1,600 m2/d and median transmissivity of 2,600 m2/d
- 25 and 75 percentiles of the transmissivity data of 840 m2/d and 6,100m2/d respectively, and
- Storage coefficients ranging from 7x10-5 to 0.06 with a geometric mean of 0.008 and median of 0.009.

2.1.39 It should be noted that these measurements may trend towards higher values because of the intensity of testing undertaken in high yielding sites used for river augmentation schemes.

2.1.40 Investigations in the region also illustrated variability of aquifer properties with depth, with studies indicating the majority of flow is within the top 40-50m corresponding with fracture locations with flow generally significantly less below this depth.

2.1.41 The weathered chalk may locally play an important role on the hydrogeology and continuity between the chalk and overlying aquifers and receptors. Where weathered, it is common for the chalk to be weathered to a form of chalk clay known as ‘Putty Chalk’ which can act as an aquitard. Elsewhere, harder chalk deposits may be weathered to a chalk gravel known as ‘Chalk Bearings’ which can be highly transmissive.

2.1.42 The Lambeth Group comprises a mixture of clays, silts and sands. In some areas of the Hampshire basin, the formation is predominantly clay and unproductive for water supply. Other areas, consist of sandy strata which can yield flows in the order of 100 m3/d. Where sandy basal layers within the group are present, they can be

important in relation to the underlying chalk as they are thought to lead to enhanced development of dolines (also known as sinkholes) and other solution features [58].

2.1.43 The London Clay Formation of the Thames Group is generally of little significance as an aquifer due to its clayey natures. However, a number of lenticular beds of fine to medium grained sands are present which may constitute useful aquifers including the Bognor and Whitecliff sand members. Yields of 500m3/d have been observed from the Whitecliff Sand, although other areas have been significantly less productive [58].

2.1.44 Lateral and vertical heterogeneity in the sand and clay content of the Bracklesham Group have a corresponding effect on aquifer properties. Where sandy beds are developed, reasonable yields may be experienced from wells, although the water may be ferruginous [58].

Karst

2.1.45 Chalk is an unusual karst aquifer in that cave development can be limited, but extensive networks of smaller solutional conduits and fissures that enable rapid groundwater flow are present.

2.1.46 Dolines, stream sinks, dissolution pipes and springs are common in chalk bedrock with the Bedhampton and Havant spring complex in Hampshire (within our study area) being one of the best examples of karstic springs in the UK, producing a combined flow rate in the order of 600 – 2,000 l/s (Allen and Crane, 2019).

2.1.47 Up to 45 stream sinks have been mapped to the north of the study area in the Horndean and Rowlands Castle areas. These are found in the area close to the boundary between the chalk and Palaeogene formations and are critical point sources of recharge for the aquifer, as there are no permanent streams in the area. The water that enters the stream sinks is considered to flow through the chalk beneath the Chichester Syncline and then emerge in the Bedhampton and Havant spring complex to the south (circa 5-6km distance) (Matheson et al, 2019). Tracer testing undertaken in the 1970s indicated significant groundwater velocities in the order of 2-3 km/d and supported the presence of a well-developed conduit system linking the stream sinks north of the Chichester Syncline to the spring complex, with low attenuation and dilution.

2.1.48 Rapid flow has also been detected at Otterbourne (Allen et al, 1997). Rapid flow supports the presence of karst features, which has implications for pollution and groundwater quality risks (such as turbidity).

Rainfall and recharge

2.1.49 Average rainfall at a number of the closest climate stations to the study area are summarised in Table 2-2 below.

Table 2-2: Average rainfall at proximal climate stations

	Average Rainfall (mm) [Climate Period 1991-2020]		
Month	**Thorney Island E: 476113 N: 102160**	**Solent MRSC E: 455902 N: 101126**	**Southampton W.C E: 442078 N: 111450**
January	84.47	73.86	89.37
February	57.67	52.32	63.86
March	49.85	45.44	56.01
April	49.64	41.45	52.27
May	43.26	41.06	47.37
June	48.20	48.25	56.90
July	46.88	48.30	44.01
August	57.17	55.74	58.90
September	61.40	53.27	60.45
October	85.95	83.40	92.55
November	90.56	90.78	99.93
December	92.62	89.61	96.94
Annual	767.67	723.48	818.56

2.1.50 Recharge to groundwater is anticipated to be predominantly to the north in the South Downs where infiltration rates would be greater, and karst stream sinks are identified (particularly to the north of the Scoping Area in the east, above Havant Thicket Reservoir). The lower permeability deposits (e.g., London Clay and the Lambeth Group) and extensive urbanisation that underlies significant sections of the preferred pipeline corridor are anticipated to retard groundwater infiltration rates in these areas.

2.1.51 Due to the karstic nature of the chalk, rainfall in the South Downs is known to have an impact on the groundwater quality with turbidity a particular issue at the Havant Springs and Otterbourne following rainfall (implying rapid recharge or a connection with surface water) [56].

2.1.52 A number of more proximal EA monitoring stations are located within the study area which record climatic data, with precipitation data provided by the EA for these sites. This data would be incorporated into future iterations of the HIA.

2.2 Local understanding

2.2.1 A summary of the local conditions and receptors within the study area for each section of the Proposed Development are detailed below.

Proposed Water Recycling Plant

2.2.2 The proposed WRP would be located in the vicinity of Budds Farm WTW and would have a peak output of approximately 60Ml/d. The proposed WRP uses advanced treatment techniques to turn highly treated wastewater that is usually pumped to the water environment into purified recycled water. The proposed HLPS

would be located at the site of the proposed WRP or along the underground pipeline between Havant Thicket Reservoir and Otterbourne WSW.

Topography

2.2.3 The Water Recycling Plant site is located at an elevation in the order of 5 to 15 metres Above Ordnance Datum (m AOD).

2.2.4 The topography in the wider study area generally increases gently towards the north towards the Chalk Downs, and steeply to the north-west of the site, where the Portsdown Hill chalk ridge is located. Langstone Harbour is located to the south of the site (circa 200-300m) and has an elevation in the order of 2m AOD, which is submerged at high tide.

Designated sites

2.2.5 A SPZ is located circa 350m north of the proposed WRP site associated with the chalk springs at Bedhampton which are used for potable water supply by Portsmouth Water. The area is an SPZ1 zone (inner zone) which indicates a zone where there is a 50-day travel time of pollutant to source. This SPZ1 zone is approximately 300m wide north to south, north of which is SPZ 1c – which refers to an area with a protective cover of low permeability sat above a unit of high permeability, which if mined or tunnelled into would be representative of SPZ1. In this case, London Clay provides much of the cover above chalk members.

2.2.6 Langstone Harbour circa 200 to 300m south of the site is an environmentally significant site and has a number of statutory environmental designations including:

- SSSI – ‘Langstone Harbour’ (also noted as a GWDTE)
- SPA – ‘Chichester and Langstone Harbour’
- Ramsar site – ‘Chichester and Langstone Harbours’
- SAC – ‘Solent Maritime’

2.2.7 Environmental designations within the study area are illustrated in Figure 8.1 within Volume III, with SPZ shown in Figure 18.5 within Volume III.

Surface watercourses

2.2.8 The proposed WRP study area (proposed WRP site plus 1km buffer) includes three surface water catchment areas, as summarised in Table 2-3. The Langstone Harbour transitional water body is immediately adjacent to the proposed WRP site, whilst the Hermitage Stream and Lavant (Hants) catchments are at distance.

Table 2-3: Surface water catchments in study area

	Langstone Harbour Transitional Water Body	Hermitage Stream	Lavant (Hants) Catchment
Water Body ID	**GB580705130000**	**GB107042016370**	**GB107042016420**
River Basin District	South East	South East	South East

	Langstone Harbour Transitional Water Body	Hermitage Stream	Lavant (Hants) Catchment
Water Body ID	**GB580705130000**	**GB107042016370**	**GB107042016420**
Hydromorphological Designation	Heavily Modified	Heavily Modified	Not designated artificial or heavily modified
Current Ecological	Moderate	Moderate	Poor
Current Chemical	Fail	Fail	Fail
Ecological Objective	Good	Good	Good
Chemical Objective	Good	Good	Good
Protected areas	Nitrate Directives, Habitats and Species Directives (SAC), Shellfish Water Directives, Conservation of Wild Birds Directives (SPA), Urban Waste Water Treatment Directive	Nitrate Directives, Shellfish Water Directive	Nitrate Directives, Shellfish Water Directive

2.2.9 On the eastern side of the proposed WRP, the EA Main River 'Hermitage Stream' flows south towards the Langstone Harbour. The Hermitage is fed by a number of smaller watercourses in the area, including Brockhampton Stream, which are anticipated to be primarily groundwater fed by Chalk springs. At the eastern edge of the study area, the EA main river 'Lavant (Hants)' also flows south towards the Langstone Harbour. No surface watercourses are mapped in the western half of the study area.

2.2.10 Surface water catchments and main rivers are illustrated in Figure 18.1 within Volume III.

Superficial deposits

2.2.11 Table 2-4 details the superficial geology in the proposed WRP study area. The proposed WRP is located on landfill, which would be considered by the Land quality and ground conditions topic.

Table 2-4: Superficial deposits within study area

Geology	Description	Location and prevalence	Mapped within study area
Head	Clay, Silt, Sand and Gravel	Mapped at distance to north of site (e.g. at base of Portsdown Hill) and north-east associated with surface watercourse valleys (e.g. Lavant river)	No
River Terrace Deposits (Undifferentiated)	Sand, Silt and Clay	Mapped north and east of the site.	Yes - Northern edge of site

Geology	Description	Location and prevalence	Mapped within study area
Alluvium	Clay, Silt, Sand and Gravel	To east of site, associated with Hermitage, and Lavant watercourses	No
Raised Marine Deposits	Sand and Gravel	Site mapped as being underlain by Raised Marine Deposits which extend to west of site along the coast.	Yes - Majority of site underlain by Raised Marine Deposits
Beach and Tidal Flat Deposits (Undifferentiated)	Clay, Silt, Sand and Gravel	Mapped to south of site associated with the sea (e.g. Langstone Harbour)	No
No superficial cover		No superficials mapped to the north of the study area, where the topography increases (e.g. Portsdown Hill)	No

Bedrock geology

2.2.12 Table 2-5 details the bedrock geology in the proposed WRP study area.

Table 2-5: Bedrock geology within study area

Geology	Description	Location and prevalence	Mapped within study area
Undifferentiated Chalk (Lewes Nodular, Seaford Chalk, Newhaven Chalk, Sulver Chalk and Portsdown Chalk Formations)	Chalk	Underlying circa three quarters of the study area included directly beneath the site	Yes
Newhaven Chalk Formation	Chalk	Mapped in north-west of study area	No
Tarrant Chalk Member	Chalk	Mapped in north-west of study area	No
Spetisbury Chalk Member	Chalk	Mapped in north-west of study area	No
Portsdown Chalk Formation	Chalk	Mapped in north-west of study area	No
Lambeth Group	Clay, Silt and Sand	Mapped in north of study area overlying the chalk	No
London Clay	Clay, Silt and Sand	Mapped in north of study area overlying the Lambeth Group	No

Groundwater-surface water interactions (springs, sinks, karst and GWDTE)

2.2.13 The Bedhampton and Havant springs complex is one of the best examples of karst-fed Chalk springs in the UK, with a number of the springs being used for potable water supply as documented in the abstractions section below.

2.2.14 It is anticipated that additional springs are present within the area around Bedhampton and Havant. Springs and seepages are also likely to be present below and in the banks of local surface watercourses.

2.2.15 Springs in the area have not been mapped at the EIA Scoping stage, and no data on any sinks, karst features or GWDTE (non-designated GWDTE; designated GWDTE noted in Designated sites section) in the area has been ascertained at this time. Data would be collated for future revisions of the HIA.

Groundwater levels

2.2.16 At this time no site-specific groundwater levels have been collated and reviewed for the area. However, it is anticipated that groundwater levels in the Chalk bedrock would be shallow or flowing artesian, due to the presence of numerous springs in the area.

2.2.17 Due to the proximity to the sea, it is anticipated that groundwater levels at the site may be tidally influenced.

Groundwater quality

2.2.18 At this time no site-specific groundwater quality data has been ascertained for the area.

2.2.19 The groundwater within the Chalk is not anticipated to be saline, due to the dominant flow paths and heads from the north. Regionally the vast majority of unconfined groundwaters within the Wessex Basin Chalk are of the Calcium Bicarbonate (Ca-HCO3) type.

2.2.20 The proximity to the sea, means that shallow groundwater within the superficial deposits may be brackish or saline.

Groundwater flooding

2.2.21 Hampshire has a known history of groundwater flooding, with over 100 towns and villages across the County suffering significant flooding during the winter of 2000/2001.

2.2.22 Due to the significant groundwater flooding risk in the county, HCC has developed a groundwater management plan [59] to identify the areas at risk and put in place measures to mitigate risk. The plan identifies key settlements at risk including Hambledon, Rowlands Castle and Finchdean to the north (located at the southern boundary of the Chalk Downs, outside the proposed WRP study area). These areas at risk are monitored by the EA with flood risk alerts issued, as required.

2.2.23 The groundwater flooding risk in the proposed WRP study area has not been assessed in detail in this report.

Abstractions

2.2.24 Three licensed groundwater abstraction are located within the study area of the proposed WRP to the north east, as documented in Table 2-6 below.

Table 2-6: Licensed groundwater abstractions

License Holder	License No.	Use	Point Name
Portsmouth Water	11/42/36.2/1	Public Water Supply	Bedhampton PS Spring No 1
Portsmouth Water	11/42/36.2/1	Public Water Supply	Bedhampton PS Spring No 2
Portsmouth Water	11/42/36.2/1	Public Water Supply	Havant PS

2.2.25 HBC were contacted in regard to unlicensed abstractions (<20 m3/day) within the area, but no data was available for the area.

2.2.26 Abstractions within the study area are illustrated in Figure 18.5 within Volume III.

Discharges

2.2.27 Five consented (by the Environment Agency) discharges are located within the study area of the proposed WRP to the east, as documented in Table 2-7.

Table 2-7: Consented discharges

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
De La Rue Systems	P00174	Undefined or Other	High Technology Campus	Freshwater River
Southern Water Services Ltd	A00752	WTW	Budds Farm Havant CSO	Brockhampton Creek
North Shore Yacht Yards Ltd	N01265	Undefined or Other	Boshampton Lane	Saline Estuary
Southern Water Services Ltd	A00751	WTW	Budds Farm WTW	The Solent/Langstone Harbour
Scottish and Southern Energy PLC	P05514	Undefined or Other	Land East of Southmoor Lane	Unnamed Tributary of Lavant Stream

2.2.28 Discharges within the study area are illustrated in Figure 18.5 within Volume III.

Proposed Underground Pipeline between Budds Farm Water Treatment Works and the proposed Water Recycling Plant

2.2.29 A Proposed Underground Pipeline from the proposed WRP to the existing Budds Farm WTW that crosses below the Hermitage, together with the Budds Farm WTW site

Topography

2.2.30 To the west of the Hermitage, the topography ranges from 5-9m OD. On the east of the Hermitage, the topography ranges from 4-7mOD. The topography/bathymetry at the location of the Hermitage is unknown from LiDAR data alone, but is expected to be close to 0mOD, due to the proximity to the sea.

Designated sites

2.2.31 A SPZ is located circa 550m north of the north-western end of the underground pipeline and is associated with the chalk springs at Bedhampton which are used for potable water supply by Portsmouth Water. The area is an SPZ1 zone (inner zone) which indicates a zone where there is a 50-day travel time of pollutant to source. This SPZ1 zone is approximately 300m wide north to south, north of which is SPZ 1c – which refers to an area with a protective cover of low permeability sat above a unit of high permeability, which if mined or tunnelled into would be representative of SPZ1. In this case, London Clay provides much of the cover above Chalk members.

2.2.32 Langstone Harbour is immediately adjacent to the southern half of the Scoping Area, and is an environmentally significant site with a number of statutory environmental designations including:

- SSSI – 'Langstone Harbour' (also noted as a GWDTE)
- SPA – 'Chichester and Langstone Harbour'
- Ramsar site – 'Chichester and Langstone Harbours'
- SAC – 'Solent Maritime'

2.2.33 The Scoping Area partly encroaches onto the Langstone Harbour designated site in the south-west.

2.2.34 Environmental designations along the preferred pipeline corridor are illustrated in Figure 8.1 within Volume III, with SPZ shown in Figure 18.5 within Volume III.

Surface watercourses

2.2.35 The Proposed Underground Pipeline between Budds Farm WTW and the proposed WRP study area includes three surface water catchment areas, as summarised in Table 2-8 below. The underground pipeline passes through the Langstone Harbour transitional water body and at other points is immediately adjacent to the underground pipeline study area, whilst the Hermitage Stream and Lavant (Hants) catchments are at distance (0.7 km and 0.8 km at closest to the underground pipeline respectively).

Table 2-8: Surface water catchments in study area

	Langstone Harbour Transitional Water Body	**Hermitage Stream**	**Lavant (Hants) Catchment**
Water Body ID	**GB580705130000**	**GB107042016370**	**GB107042016420**
River Basin District	South East	South East	South East

	Langstone Harbour Transitional Water Body	Hermitage Stream	Lavant (Hants) Catchment
Water Body ID	**GB580705130000**	**GB107042016370**	**GB107042016420**
Hydromorphological Designation	Heavily Modified	Heavily Modified	Not designated artificial or heavily modified
Current Ecological	Moderate	Moderate	Poor
Current Chemical	Fail	Fail	Fail
Ecological Objective	Good	Good	Good
Chemical Objective	Good	Good	Good
Protected areas	Nitrate Directives, Habitats and Species Directives (SAC), Shellfish Water Directives, Conservation of Wild Birds Directives (SPA), Urban Waste Water Treatment Directive	Nitrate Directives, Shellfish Water Directive	Nitrate Directives, Shellfish Water Directive

2.2.36 Passing across the underground pipeline study area is the EA main river 'Hermitage Stream' which flows south towards the Langstone Harbour. The Hermitage is fed by a number of smaller watercourses in the area, including Brockhampton Stream, which are anticipated to be primarily groundwater fed by Chalk springs. At the eastern part of the study area, the EA main river 'Lavant (Hants)' also flows south towards the Langstone Harbour. No surface watercourses are mapped in the western part of the study area.

2.2.37 Surface water catchments and main rivers are illustrated in Figure 18.1 within Volume III.

Superficial deposits

2.2.38 The route of the proposed WRP to Budds Farm WTW underground pipeline (from the ground in the north-west to the south-east) is underlain by Raised Marine Deposits, Beach and Tidal Flat Deposits and Alluvium. Table 2-9 details the superficial geology in the underground pipeline study area.

Table 2-9: Superficial deposits in study area

Geology	Description	Location and prevalence	Mapped within Corridor
Head	Clay, Silt, Sand and Gravel	Thin band in the north of the study area, smaller strips in the east of the study area adjacent to Alluvium	No
River Terrace Deposits (Undifferentiated)	Sand, Silt and Clay	Half of the north of the study area underlain by RTD when not underlain by Alluvium or Head	No

Geology	Description	Location and prevalence	Mapped within Corridor
Alluvium	Clay, Silt, Sand and Gravel	Adjacent to the surface watercourses in the north and east of the study area.	Yes – South-eastern end of underground pipeline route
Raised Marine Deposits	Sand and Gravel	Narrow strip in the west of the study area and a smaller area in the south-east of the study area	Yes –North-western end of underground pipeline route
Beach and Tidal Flat Deposits (Undifferentiated)	Clay, Silt, Sand and Gravel	Majority of southern half of study area	Yes – Where the underground pipeline crosses the Hermitage
No superficial cover		Small area on northern edge of study area	No

Bedrock geology

2.2.39 The proposed WRP to Budds Farm WTW underground pipeline is mapped as being underlain by Undifferentiated Chalk (Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation). The northern edge of the underground pipeline study area is underlain with narrow bands of four Chalk formations: Newhaven Chalk Formation, Tarrant Chalk Member, Spetisbury Chalk Member and Portsdown Chalk Formation, in addition to a narrow band of Lambeth Group – Clay, Silt and Sand, and a small area of London Clay Formation – Clay, Silt and Sand. Table 2-10 details the bedrock geology in the underground pipeline study area.

Table 2-10: Bedrock geology in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
Undifferentiated Chalk (Lewes Nodular, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations)	Chalk	Underlying circa three quarters of the study area included directly beneath the site	Yes
Newhaven Chalk Formation	Chalk	Mapped in north-west of study area	No
Tarrant Chalk Member	Chalk	Mapped in north-west of study area	No
Spetisbury Chalk Member	Chalk	Mapped in north-west of study area	No
Portsdown Chalk Formation	Chalk	Mapped in north-west of study area	No
Lambeth Group	Clay, Silt and Sand	Mapped in north of study area overlying the Chalk	No

Geology	Description	Location and prevalence	Mapped Within Corridor
London Clay	Clay, Silt and Sand	Mapped in north of study area overlying the Lambeth Group	No

Groundwater-surface water interactions (springs, sinks, karst and GWDTE)

2.2.40 The Bedhampton and Havant springs complex is one of the best examples of karst-fed chalk springs in the UK, with a number of the springs being used for potable water supply as documented in the abstractions section below.

2.2.41 It is anticipated that additional springs are present within the area around Bedhampton and Havant. Springs and seepages are likely to be present below and in the banks of local surface watercourses.

2.2.42 Springs in the area have not been mapped at scoping stage, and no data on any sinks, karst features or GWDTE (non-designated GWDTE; designated GWDTE noted in Designated sites section) in the area has been ascertained at this time. Data would be collated for future revisions of the HIA.

Groundwater levels

2.2.43 At this time no site-specific groundwater levels have been collated and reviewed for the area. However, it is anticipated that groundwater levels in the Chalk bedrock would be shallow due to the presence of numerous springs in the area.

2.2.44 Due to the proximity to the sea, it is anticipated that groundwater levels at the site may be tidally influenced.

Groundwater quality

2.2.45 At this time no site-specific groundwater quality data has been ascertained for the area.

2.2.46 The groundwater within the Chalk is not anticipated to be saline, due to the dominant flow paths and heads from the north. Regionally the vast majority of unconfined groundwaters within the Wessex Basin Chalk are of the Ca-HCO3 type.

2.2.47 The proximity to the sea, means that shallow groundwater within the superficial deposits may be brackish or saline.

Groundwater flooding

2.2.48 Hampshire has a known history of groundwater flooding, with over 100 towns and villages across the county suffering significant flooding during the winter of 2000/2001.

2.2.49 Due to the significant groundwater flooding risk in the county, HCC has developed a groundwater management plan to identify the areas at risk and put in place measures to mitigate risk. The plan identifies key settlements at risk including Hambledon, Rowlands Castle and Finchdean to the north (located at the southern

boundary of the Chalk Downs, outside the proposed WRP study area). These areas at risk are monitored by the EA with flood risk alerts issued, as required.

2.2.50 The groundwater flooding risk in the Budds Farm to proposed WRP study area has not been assessed at this time.

Abstractions

2.2.51 Three licensed groundwater abstraction are located within the study area of the Budds Farm to proposed WRP Underground pipeline to the north-east, as documented in Table 2-11 below.

Table 2-11: Licensed groundwater abstractions

Licensee	License No.	Use	Point Name
Portsmouth Water	11/42/36.2/1	Public Water Supply	Bedhampton PS Spring No 1
Portsmouth Water	11/42/36.2/1	Public Water Supply	Bedhampton PS Spring No 2
Portsmouth Water	11/42/36.2/1	Public Water Supply	Havant PS

2.2.52 HBC were contacted in regard to unlicensed abstractions (<20 m3/day) within the area, but no data was available for the area.

2.2.53 Abstractions within the study area are illustrated in Figure 18.5 within Volume III.

Discharges

2.2.54 Six consented discharges are located within the study area of the Budds Farm to proposed WRP underground pipeline to the east, as documented in Table 2-12 below.

Table 2-12: Consented discharges

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
De La Rue Systems	P00174	Undefined or Other	High Technology Campus	Freshwater River
Southern Water Services Ltd	A00752	WTW	Budds Farm Havant CSO	Brockhampton Creek
North Shore Yacht Yards Ltd	N01265	Undefined or Other	Boshampton Lane	Saline Estuary
Southern Water Services Ltd	A00751	WTW	Budds Farm WTW	The Solent/Langstone Harbour
Scottish and	P05514	Undefined or Other	Land East of Southmoor Lane	Unnamed Tributary of Lavant Stream

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
Southern Energy PLC				
Fasset Limited	N01162	Making of Computers/Electronics /Optical Products	Langstone Road	Freshwater River

2.2.55 Discharges within the study area are illustrated in Figure 18.5 within Volume III.

Proposed Underground Pipeline between the proposed Water Recycling Plant and Havant Thicket Reservoir

2.2.56 The underground pipeline between the proposed WRP and Havant Thicket Reservoir is anticipated to be constructed within a underground pipeline that runs northwards from the proposed WRP towards Havant Thicket Reservoir where the pipeline would ultimately terminate. The feasibility of having part of the pipeline above ground is also being assessed.

Topography

2.2.57 The topography from the south-western end of the underground pipeline (at the proposed WRP) falls from around 14mOD to around 4mOD. It then gradually rises up to around 20mOD before falling into the valley of a tributary of the Hermitage stream. It then follows along the eastern side of this valley, rising up at the north-eastern end towards Havant Thicket Reservoir.

Designated sites

2.2.58 The underground pipeline between the proposed WRP and Havant Thicket Reservoir is situated within a SPZ for all but the most southern 500m of the alignment. This SPZ is associated with the Chalk springs at Bedhampton which are used for potable water supply by Portsmouth Water. The most southern area is an SPZ1 zone (inner zone) which indicates a zone where there is a 50-day travel time of pollutant to source. This SPZ1 zone is approximately 300m wide north to south, north of which is SPZ 1c – which refers to an area with a protective cover of low permeability sat above a unit of high permeability, which if mined or tunnelled into would be representative of SPZ1. In this case, London Clay provides much of the cover above Chalk members.

2.2.59 Langstone Harbour circa 400m south of the southern end of the alignment and is an environmentally significant site and has a number of statutory environmental designations including:

- SSSI – ‘Langstone Harbour’ (also noted as a GWDTE)
- SPA – ‘Chichester and Langstone Harbour’
- Ramsar site – ‘Chichester and Langstone Harbours’
- SAC – ‘Solent Maritime’

2.2.60 Environmental designations along the preferred pipeline corridor are illustrated in Figure 8.1 within Volume III, with SPZ shown in Figure 18.5 within Volume III.

Surface watercourses

2.2.61 The underground pipeline between the proposed WRP and Havant Thicket Reservoir study area includes three surface water catchment areas, as summarised in Table 2-13 below. The underground pipeline passes through the Hermitage Stream water body catchment in the northern half of the alignment, whilst the Langstone Harbour Transitional Water Body and Lavant (Hants) catchments are at distance (circa 100m and 700m respectively at their closest).

Table 2-13: Surface water catchments in study area

	Langstone Harbour Transitional Water Body	Hermitage Stream	Lavant (Hants) Catchment
Water Body ID	GB580705130000	GB107042016370	GB107042016420
River Basin District	South East	South East	South East
Hydromorphological Designation	Heavily Modified	Heavily Modified	Not designated artificial or heavily modified
Current Ecological	Moderate	Moderate	Poor
Current Chemical	Fail	Fail	Fail
Ecological Objective	Good	Good	Good
Chemical Objective	Good	Good	Good
Protected areas	Nitrate Directives, Habitats and Species Directives (SAC), Shellfish Water Directives, Conservation of Wild Birds Directives (SPA), Urban Waste Water Treatment Directive	Nitrate Directives, Shellfish Water Directive	Nitrate Directives, Shellfish Water Directive

2.2.62 Passing across the underground pipeline study area is the EA main river 'Hermitage Stream' which flows south towards the Langstone Harbour. The Hermitage is fed by a number of smaller watercourses in the area, including Brockhampton Stream, which are anticipated to be primarily groundwater fed by Chalk springs. The underground pipeline alignment crosses The Hermitage having been routed alongside one of its tributaries. At the eastern part of the study area, the EA main river 'Lavant (Hants)' also flows south towards the Langstone Harbour.

2.2.63 Surface water catchments and main rivers are illustrated in Figure 18.1 within Volume III.

Superficial deposits

2.2.64 The route of the Proposed Underground Pipeline from south-west to north-east is underlain by Raised Marine Deposits, Beach, River Terrace Deposits and Alluvium in the south west, much of the mid-section of the study area is underlain by Head deposits, with a ~0.2km section of no superficial cover, the north-eastern end has no superficial cover whilst large parts of Havant Thicket Reservoir are also underlain by Head deposits. Table 2-14 details the superficial geology in the study area.

Table 2-14: Superficial deposits in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
Head	Clay, Silt, Sand and Gravel	Much of the central part of study area (when viewing area as north to south) is underlain with Head deposits, with more sparse coverage in the north of the study area. Large parts of Havant Thicket Reservoir mapped as being underlain by Head.	Yes
River Terrace Deposits (Undifferentiated)	Sand, Silt and Clay	A band extending from the south-west of the study area to midway up the eastern side of the study area	Yes
Alluvium	Clay, Silt, Sand and Gravel	Adjacent to the surface watercourses in the south of the study area.	Yes
Raised Marine Deposits	Sand and Gravel	Narrow strip in the south of the study area	Yes
Beach and Tidal Flat Deposits (Undifferentiated)	Clay, Silt, Sand and Gravel	Covers all of the most southerly end of the study area	Study area only
No superficial cover		Areas in south-west of study area, a small section directly on the underground pipeline corridor halfway along and much of the northern end of the study area	Yes

Bedrock geology

2.2.65 The study area is underlain from south-west to north-east by Undifferentiated Chalk (Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation) at its south-western end, then a narrow band of Lambeth Group, before a larger area of London Clay Formation (Clay Silt and Sand). A couple of more granular members of the London Clay are mapped along the preferred pipeline corridor: Bognor Sand Member and London Clay Formation (Sand). Most of the north-eastern end of the study area is underlain by the Bognor Sand Member before returning to London Clay at the extreme northern end of the underground pipeline corridor. Table 2-15 details the bedrock geology in the study area.

Table 2-15: Bedrock geology in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
Undifferentiated Chalk (Lewes Nodular, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations)	Chalk	Majority of south-western third of study area	Yes
Lambeth Group	Clay, Silt and Sand	Narrow band directly north of Lewes Nodular, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations Chalk	Yes
London Clay Formation	Clay, Silt and Sand	Much of the central area and part of the north-easter end of the study area	Yes
London Clay Formation	Sand	Small area directly on the preferred pipeline corridor halfway along	Yes
Bognor Sand Member	Sand	Narrow band across study area a third of the way along the study area from the south-west heading north-east, and a larger area covering half of the north-eastern third of the study area	Yes
Newhaven Chalk Formation	Chalk	Narrow band on western edge of south-western end of study area	Study area only
Tarrant Chalk Member	Chalk	Narrow band on western edge of south-western end of study area	Study area only
Spetisbury Chalk Member	Chalk	Narrow band on western edge of south-western end of study area	Study area only
Portsdown Chalk Member	Chalk	Narrow band on western edge of south-western end of study area	Study area only

Groundwater-surface water interactions (springs, sinks, karst and GWDTE)

2.2.66 The Bedhampton and Havant springs complex is one of the best examples of karst-fed Chalk springs in the UK, with a number of the springs being used for potable water supply as documented in the abstractions section below.

2.2.67 It is anticipated that additional springs are present within the area around Bedhampton and Havant. Springs and seepages are likely to be present below and in the banks of local surface watercourses.

2.2.68 Springs in the area have not been mapped at scoping stage, and no data on any sinks, karst features or GWDTE (non-designated GWDTE; designated GWDTE noted in Designated sites section) in the area has been ascertained at this time. Data would be collated for future revisions of the HIA.

Groundwater levels

2.2.69 At this time, no site-specific groundwater levels have been collated and reviewed for the area. However, it is anticipated that groundwater levels in the Chalk bedrock in the south would be shallow due to the presence of numerous springs in the area.

2.2.70 Due to the proximity to the sea in the south, it is anticipated that groundwater levels in the south may be tidally influenced.

Groundwater quality

2.2.71 At this time no site-specific groundwater quality data has been ascertained for the area.

2.2.72 The groundwater within the Chalk is not anticipated to be saline, due to the dominant flow paths and heads from the north. Regionally the vast majority of unconfined groundwaters within the Wessex Basin Chalk are of the Ca-HCO3 type. The groundwater quality of the superficial deposits and London Clay are likely to be more variable, with shallower groundwaters in the superficials more susceptible to anthropogenic activities.

2.2.73 The proximity to the sea in the south, means that shallow groundwater within the superficial deposits may be brackish or saline towards the coast.

Groundwater flooding

2.2.74 Hampshire has a known history of groundwater flooding, with over 100 towns and villages across the county suffering significant flooding during the winter of 2000/2001.

2.2.75 Due to the significant groundwater flooding risk in the county, HCC has developed a groundwater management plan to identify the areas at risk and put in place measures to mitigate risk. The plan identifies key settlements at risk including Hambledon, Rowlands Castle and Finchdean to the north (located at the southern boundary of the Chalk Downs, outside the study area). These areas at risk are monitored by the EA with flood risk alerts issued, as required.

2.2.76 The groundwater flooding risk in the Water Recycling Plant to Havant Thicket Reservoir study area has not been assessed at this time. The risk of groundwater flooding is more likely in areas where the Chalk bedrock or permeable superficial deposits are observed.

Abstractions

2.2.77 Three licensed groundwater abstraction are located within the study area of the underground pipeline to the south west, as documented in Table 2-16 below.

Table 2-16: Licensed groundwater abstractions

Licence Holder	License No.	Use	Point Name
Portsmouth Water	11/42/36.2/1	Public Water Supply	Bedhampton PS Spring No 1
Portsmouth Water	11/42/36.2/1	Public Water Supply	Bedhampton PS Spring No 2

Licence Holder	License No.	Use	Point Name
Portsmouth Water	11/42/36.2/1	Public Water Supply	Havant PS

2.2.78 HBC and EHDC were both contacted in regard to unlicensed abstractions (<20 m3/day) within the area. HBC and EHDC noted that no data was available for the area.

2.2.79 Abstractions within the study area are illustrated in Figure 18.5 within Volume III.

Discharges

2.2.80 Five consented discharges are located within the study area of the underground pipeline alignment, as documented in Table 2-17 below.

Table 2-17: Consented discharges

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
De La Rue Systems	P00174	Undefined or Other	High Technology Campus	Freshwater River
Southern Water Services Ltd	A00752	WTW	Budds Farm Havant CSO	Brockhampton Creek
North Shore Yacht Yards Ltd	N01265	Undefined or Other	Boshampton Lane	Saline Estuary
Southern Water Services Ltd	A00751	WTW	Budds Farm WTW	The Solent/Langstone Harbour
Southern Water Services Ltd	A01016	Storm Tank/CSO on Sewerage Network (water company)	Priorsdean Crescent Havant CSO	Hermitage Stream

2.2.81 Discharges within the study area are illustrated in Figure 18.5 within Volume III.

Proposed Underground Pipeline between Havant Thicket Reservoir and Otterbourne Water Supply Works

2.2.82 This component of the Proposed Development includes the 'Proposed Underground Pipeline between the proposed WRP and Havant Thicket Reservoir' study area, of which the baseline is documented in the previous section.

2.2.83 For ease of reference the Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW has been split into shorter sections:

- Proposed WRP to land west of London Road (A3)
- Land west of London Road (A3) to A32 Road

- A32 to Shirrel Heath
- Shirrel Heath to Bishop's Waltham
- Bishop's Waltham to Otterbourne

Proposed Water Recycling Plant to Land West of London Road (A3)

2.2.84 The proposed WRP to land west of London Road (A3) study area comprises two potential pipeline corridors.

Topography

Northern pipeline corridor

2.2.85 The main feature of the topography is the increase in ground level elevation from around 20mOD to 70mOD over a relatively short distance (~1km) corresponding to Portsdown Hill. Before and after this incline, the ground level elevation has undulations, but is generally fairly uniform.

Southern pipeline corridor

2.2.86 The main feature of the topography is the increase in ground level elevation from around 20mOD to 50mOD over a relatively short distance (~1km) before a more gradual increase in elevation to 90m, before finally going downhill to an elevation of ~50m at the northern end. The higher topographical elevation corresponds to the chalk Portsdown Hill.

Designated sites

Northern and southern pipeline corridors

2.2.87 The northern pipeline corridor is situated within a SPZ for about half of underground pipeline alignment, from the middle to the north-western end. The southern pipeline corridor is situated within a SPZ for only the most northern 150m of the underground pipeline alignment.

2.2.88 This SPZ is associated with the Chalk springs at Bedhampton which are used for potable water supply by Portsmouth Water. In the north-east of the study area but not on the underground pipeline alignment itself (around 100m at closest to underground pipeline alignment) is an SPZ1 zone (inner zone) which indicates a zone where there is a 50-day travel time of pollutant to source. This SPZ1 zone is approximately 200m wide north to south at closest, north, and west of which is SPZ 1c – which refers to an area with a protective cover of low permeability sat above a unit of high permeability, which if mined or tunnelled into would be representative of SPZ1. In this case, London Clay provides much of the cover above Chalk members. The SPZ which is crossed by the underground pipeline alignment is all SPZ 1c.

2.2.89 Langstone Harbour circa 400m south of the south-eastern end of the alignment and is an environmentally significant site and has a number of statutory environmental designations including:

- SSSI – 'Langstone Harbour' (also noted as a GWDTE)

- SPA – 'Chichester and Langstone Harbour'
- Ramsar site – 'Chichester and Langstone Harbours'
- SAC – 'Solent Maritime'

2.2.90 Environmental designations along the preferred pipeline corridor are illustrated in Figure 8.1 within Volume III, with SPZs shown in Figure 18.5 within Volume III.

Southern pipeline corridor

2.2.91 Portsdown SSSI is circa 400m south-west of the southern pipeline corridor where it diverts northwards near the A3. The site is designated a SSSI owing to the Chalk Grassland Habitat.

Surface watercourses

Northern and southern pipeline corridors

2.2.92 The northern and southern pipeline corridor study area includes three surface water catchment areas, as summarised in Table 2-18 below. The pipeline corridors pass through the Potwell Trib water body catchment in the western end of the study area, whilst the Langstone Harbour Transitional Water Body and Hermitage Stream catchments are at distance.

Table 2-18: Surface water catchments in study area

	Potwell Trib Water Body	Langstone Harbour Transitional Water Body	Hermitage Stream
Water Body ID	GB107042016400	GB580705130000	GB107042016370
River Basin District	South East	South East	South East
Hydromorphological Designation	Heavily Modified	Heavily Modified	Heavily Modified
Current Ecological	Moderate	Moderate	Moderate
Current Chemical	Fail	Fail	Fail
Ecological Objective	Good	Good	Good
Chemical Objective	Good	Good	Good
Protected areas	Nitrates Directive	Nitrate Directives, Habitats and Species Directives (SAC), Shellfish Water Directives, Conservation of Wild Birds Directives (SPA), Urban Waste Water Treatment Directive	Nitrate Directives, Shellfish Water Directive

2.2.93 No main rivers are crossed by either pipeline corridor. Passing across the underground pipeline study area is the EA main river 'Hermitage Stream' which

flows south towards the Langstone Harbour. The Hermitage is fed by a number of smaller watercourses in the area, including Brockhampton Stream, which are anticipated to be primarily groundwater fed by Chalk springs. At the western part of the study area, the EA main river Potwell Trib also flows east towards Southwick Park Lake.

2.2.94 Surface water catchments and main rivers are illustrated in Figure 2.1 within Volume III.

Superficial deposits

Northern and southern pipeline corridors

2.2.95 Both pipeline corridors are underlain by Raised Marine Deposits, River Terrace Deposits and Head in the south-east, much of the mid-section and north-western section of the pipeline corridor have no superficial cover, other than small areas of Head.

2.2.96 In the study area, most of the north of the study area has no superficial deposits, with discrete areas of Head deposits and a small amount of Alluvium. Most of the southern and south-eastern region of the study area has superficial cover, with a band of Head north of a band of River Terrace Deposits, north of an area of Raised Marine Deposits, which is north of Beach and Tidal Flat Deposits. East of the underground pipeline within the study area exists an area of Alluvium, Head and River Terrace deposits. Table 2-19 details the superficial geology in the underground pipeline study area.

Table 2-19: Superficial deposits in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
Head	Clay, Silt, Sand and Gravel	A wide band south of the east – west section of the underground pipeline, and irregularly shaped areas in the north of the study area. Underground pipeline crosses in south-east and five small sections in the north.	Yes
River Terrace Deposits (Undifferentiated)	Sand, Silt and Clay	A band south of the band of Head. Underground pipeline crosses in the south-eastern end.	Yes
Alluvium	Clay, Silt, Sand and Gravel	Small section in north-west of study area and larger area in south-east.	No
Raised Marine Deposits	Sand and Gravel	Small area in south-east of study area, underground pipeline crosses at south-eastern end.	Yes
Beach and Tidal Flat Deposits (Undifferentiated)	Clay, Silt, Sand and Gravel	Small area in south-east of study area.	No
No superficial cover		Much of the northern half of the study area has no superficial cover, including most of the pipeline corridor.	Yes

Bedrock geology

Northern and southern pipeline corridors

2.2.97 Both pipeline corridors are underlain from south-east to north-west by Undifferentiated Chalk (Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation), narrow bands of Newhaven Chalk Formation, Tarrant Chalk Member, Spetisbury Chalk Member, Portsdown Chalk Member and Lambeth Group. The underground pipeline subsequently goes into a larger area of London Clay Formation (Clay Silt and Sand) broken up by the narrow bands of the Bognor Sand Member and the Wittering Formation (Sand, Silt and Clay).

2.2.98 Table 2-20 details the bedrock geology in the underground pipeline study area.

Table 2-20: Bedrock geology in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
Undifferentiated Chalk (Lewes Nodular, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations)	Chalk	Majority of the south-eastern end of the study area.	Yes
Lambeth Group	Clay, Silt and Sand	Narrow band directly north of the Chalk formations, running east to west, directly south of the London Clay Formation.	Yes
London Clay Formation	Clay, Silt and Sand	Half of the study area north of the Lambeth Group is underlain by London Clay Formation.	Yes
Wittering Formation	Sand, Silt and Clay	A large amount of the north of the study area is underlain by Wittering Formation, including two sections which the northern pipeline corridor passes over.	Yes
Bognor Sand Member	Sand	A narrow band east to west, parallel but north of the Lambeth Group and the southern area of London Clay Formation	Yes
Newhaven Chalk Formation	Chalk	A narrow band east to west, underground pipeline crosses in eastern end. Directly south of the Tarrant Chalk Member.	Yes
Tarrant Chalk Member	Chalk	A narrow band east to west, underground pipeline crosses in eastern end. Directly south of the Spetisbury Chalk Member.	Yes
Spetisbury Chalk Member	Chalk	A narrow band east to west, underground pipeline crosses in eastern end. Directly south of the Portsdown Chalk Member.	Yes
Portsdown Chalk Member	Chalk	A narrow band east to west. Directly south of the Lambeth Group.	Yes

Geology	Description	Location and prevalence	Mapped Within Corridor
Whitecliff Sand Member	Sand	Small area in the north of the study area, north of the underground pipeline, and to the south of the north-western area of Wittering Formation.	No
Wittering Formation	Sand, Silt and Clay	Two main areas of Wittering Formation in the study area, one in the extreme north of the study area, and the second in near the northern end of the underground pipeline and north of study area (in 5 distinct sections). Two of these underlies the underground pipeline at the extreme northern end.	Yes
Wittering Formation	Sand	Small section in the extreme north of the study area, in between areas of Wittering Formation (Sand, Silt and Clay)	No

Groundwater-surface water interactions (springs, sinks, karst and GWDTE)

Northern and southern pipeline corridors

2.2.99 The Bedhampton and Havant springs complex is one of the best examples of karst-fed Chalk springs in the UK, with a number of the springs being used for potable water supply as documented in the abstractions section below.

2.2.100 It is anticipated that additional springs are present within the area around Bedhampton and Havant. Springs and seepages are likely to be present below and in the banks of local surface watercourses.

2.2.101 Springs in the area have not been mapped at scoping stage, and no data on any sinks, karst features or GWDTE (non-designated GWDTE; designated GWDTE noted in Designated sites section) in the area has been ascertained at this time. Data would be collated for future revisions of the HIA.

Groundwater levels

Northern and southern pipeline corridors

2.2.102 At this time no site-specific groundwater levels have been collated and reviewed for the area. However, it is anticipated that groundwater levels in the Chalk bedrock in the south-east would be shallow due to the presence of numerous springs in the area.

2.2.103 In the Portsdown Hill area, the Chalk groundwater levels are anticipated to be more susceptible to rainfall and seasonal conditions.

2.2.104 Due to the proximity to the sea in the south, it is anticipated that groundwater levels in the south may be tidally influenced.

Groundwater quality

Northern and southern pipeline corridors

2.2.105 At this time no site-specific groundwater quality data has been ascertained for the area.

2.2.106 The groundwater within the Chalk is not anticipated to be saline, due to the dominant flow paths and heads from the north. Regionally the vast majority of unconfined groundwaters within the Wessex Basin Chalk are of the Ca-HCO3 type. The groundwater quality of the superficial deposits and London Clay are likely to be more variable, with shallower groundwaters in the superficial deposits more susceptible to anthropogenic activities.

2.2.107 The proximity to the sea in the south, means that shallow groundwater within the superficial deposits may be brackish or saline towards the coast.

Groundwater flooding

Northern and southern pipeline corridors

2.2.108 Hampshire has a known history of groundwater flooding, with over 100 towns and villages across the county suffering significant flooding during the winter of 2000/2001.

2.2.109 Due to the significant groundwater flooding risk in the county, HCC has developed a groundwater management plan to identify the areas at risk and put in place measures to mitigate risk. The plan identifies key settlements at risk including Hambledon, Rowlands Castle and Finchdean to the north (located at the southern boundary of the Chalk Downs, outside the proposed WRP study area). These areas at risk are monitored by the EA with flood risk alerts issued, as required.

2.2.110 The groundwater flooding risk in the proposed WRP to land west of London Road (A3) study area has not been assessed at this time. The risk of groundwater flooding is more likely in areas where the Chalk bedrock or permeable superficial deposits are observed.

Abstractions

Northern and southern pipeline corridors

2.2.111 Three licensed groundwater abstraction are located within the study area of the proposed WRP to land west of London Road (A3) study area to the south-east, as documented in Table 2-21 below.

Table 2-21: Licensed groundwater abstractions

License Holder	License No.	Use	Point Name
Portsmouth Water	11/42/36.2/1	Public Water Supply	Bedhampton PS Spring No 1
Portsmouth Water	11/42/36.2/1	Public Water Supply	Bedhampton PS Spring No 2
Portsmouth Water	11/42/36.2/1	Public Water Supply	Havant PS

2.2.112 HBC and PCC were contacted in regard to unlicensed abstractions (<20 m3/day) within the area, but no data was available for the area.

2.2.113 Winchester Council has provided details on unlicensed abstraction within their area, but none are recorded within the proposed WRP to Purbrook study area.

2.2.114 Abstractions within the study area are illustrated in Figure 18.5 within Volume III.

Discharges

2.2.115 Twelve consented discharges are located within the study area of the proposed WRP to land west of London Road (A3) pipeline corridors, as documented in Table 2-22 below.

Table 2-22: Consented discharges

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
De La Rue Systems	P00174	Undefined or Other	High Technology Campus	Freshwater River
Southern Water Services Ltd	A00752	WTW	Budds Farm Havant CSO	Brockhampton Creek
North Shore Yacht Yards Ltd	N01265	Undefined or Other	Boshampton Lane	Saline Estuary
Southern Water Services Ltd	A00751	WTW	Budds Farm WTW	The Solent/Langstone Harbour
Southern Water Services Ltd	A01017	Storm Tank/CSO on Sewerage Network (water company)	Lone Valley Waterlooville CSO	Tributary of River Wallington
Lift & Shift Skip Hire Ltd	P10535	Making of Machinery/Engine/Pump/ Furnace/Tractor	Farlington Redoubt	Into Land
Winchester City Council	P06856	Domestic property (single) (incl. farm house)	Field adjacent to No 1 Widley Walk	Freshwater River
J Heath Esq.	H01544	Undefined or Other	Purbrook Heath Farm	Freshwater River
Exec's of Mrs E Borthwick-Norton	H01607	Undefined or Other	The Southwick Estate	Freshwater River

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
Mr D M Daniels	H01543	Domestic property (single) (incl. farm house)	Tudor Cottage	Freshwater River
Warnings Contractors Ltd.	P02509	Undefined or Other	Warnings Contractors Ltd.	Into Land
Southern Water Services Ltd	A01278	Pumping Station on Sewerage Network (water company)	Westbrook Grove Purbrook CSO	Wallington River via Drain

2.2.116 Discharges within the study area are illustrated in Figure 18.5 within Volume III.

Proposed Break Pressure Tank to A32 Road

Topography

2.2.117 The topography along the preferred pipeline corridor, undulates with a general fall in elevation from east to west; from circa 90m OD in the east to circa 30m OD at the Wallington crossing.

2.2.118 The topography also reduces at a steep gradient from south to north away from the Portsdown Chalk hill.

Designated sites

2.2.119 In the west, the preferred pipeline corridor crosses a SPZ 2, 2c and 3. Zone 1 of the SPZ is located to the south of the corridor and is associated with the Maindell Pumping Station (PS) (see abstractions section).

2.2.120 The SPZ 1c in relation to the Bedhampton springs is located in the north-eastern extreme of the corridor.

2.2.121 A number of SSSI's are located outside the corridor but within the specified study area, including:

- Lye Heath Marsh SSSI – north of the corridor adjacent to Potwell Trib and a GWDTE
- Hook Heath Meadows SSSI – north of the corridor adjacent to Potwell Trib and a GWDTE
- Portsdown SSSI – south of corridor.

2.2.122 Environmental designations along the preferred pipeline corridor are illustrated in Figure 8.1 within Volume III, with SPZs shown in Figure 18.5 within Volume III.

Surface watercourses

2.2.123 The study area includes a number of surface water catchment areas, as summarised in Table 2-23 below.

Table 2-23: Surface water catchments within study area

	Wallington below Southwick	Upper Wallington	Potwell Trib	Meon
Water Body ID	GB107042016360	GB107042016350	GB107042016400	GB107042016640
River Basin District	South East	South East	South East	South East
Hydromorphological Designation	Not Designated	Not Designated	Heavily Modified	Not Designated
Current Ecological	Moderate	Moderate	Moderate	Good
Current Chemical	Fail	Fail	Fail	Fail
Ecological Objective	Good	Good	Good	Good
Chemical Objective	Good	Good	Good	Good
Protected areas	Nitrates Directive, Shellfish Water Directive	Nitrates Directive	Nitrates Directive	Nitrates Directive, Conservation of Wild Birds Directive, Shellfish Water Directive

2.2.124 Potwell Tributary flows westerly north of the corridor and joins with the Wallington near Southwick. The river continues to flow westerly before diverting south and through the western end of the proposed corridor.

2.2.125 Surface water catchments and main rivers are illustrated in Figure 18.1 within Volume III.

Superficial deposits

2.2.126 Table 2-24 details the superficial geology in the study area.

Table 2-24: Superficial deposits in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
Head	Clay, Silt, Sand and Gravel	Some Head deposits in the northern half of the preferred pipeline corridor which extends to a fair amount of the north of the study area. An additional band of Head deposits in the south-east of the study area.	Yes
River Terrace Deposits	Gravel, Sand and Silt	Crosses the proposed corridor in the west, alongside Wallington River. A few other isolated areas in the west of the study area	Yes

Geology	Description	Location and prevalence	Mapped Within Corridor
River Terrace Deposits (Undifferentiated)	Sand, Silt and Clay	Very small area in extreme south-east of study area.	No
Alluvium	Clay, Silt, Sand and Gravel	Crosses the proposed corridor in the west, alongside Wallington River. Extends alongside the watercourse in the north of the Scoping Area and within the wider study area to the north of the proposed corridor	Yes
No superficial cover		Most of the proposed corridor and much of the southern half and western end of the wider study area has no superficial cover, also sporadic no cover in the north.	Yes

Bedrock geology

2.2.127 Table 2-25 details the bedrock geology in the study area.

Table 2-25: Bedrock geology in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
Undifferentiated Chalk (Lewes Nodular, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations)	Chalk	Area on southern edge, at eastern end of the study area.	No
Lambeth Group	Clay, Silt and Sand	Narrow band directly north of the Chalk formations, approximately east to west and underlies the proposed corridor for its length (but not its width) other than the most western end, where the band is north of the corridor.	Yes
London Clay Formation	Clay, Silt and Sand	Directly north of the Lambeth Group is the London Clay Formation, most of the northern part of the eastern two thirds of the proposed corridor is underlain with this formation. Coverage extends for much of the northern half of the study area.	Yes
Bognor Sand Member	Sand	A narrow band east to west, parallel but north of the Lambeth Group and the southern area of London Clay Formation. Underlies the proposed corridor for the eastern 2 thirds.	Yes
Newhaven Chalk Formation	Chalk	A band approximately east to west and parallel to the south of the eastern half of the proposed	No

Geology	Description	Location and prevalence	Mapped Within Corridor
		corridor. Directly south of the Tarrant Chalk Member.	
Tarrant Chalk Member	Chalk	A narrow band approximately east to west and parallel to the south of the eastern half of the proposed corridor. Directly south of the Spetisbury Chalk Member.	No
Spetisbury Chalk Member	Chalk	A band approximately east to west and parallel to the south of the eastern half of the proposed corridor with some of the formation underlying the corridor. A larger area in the west of the study area underlies the entire width of the proposed corridor.	Yes
Portsdown Chalk Member	Chalk	A band approximately east to west and underlying most of the length of the corridor, but not underlying the entire width other than at the western end where the band is thicker. Much of the southern side of the western end of the study area is underlain with Portsdown Chalk Member.	Yes
Whitecliff Sand Member	Sand	In the north of the study area	Yes
Wittering Formation	Sand, Silt and Clay	Very small area in north-eastern corner of proposed corridor is underlain with Wittering formation. There are some larger areas of Wittering Formation on the northern edge of the study area along the east to west preferred pipeline corridor.	Yes
Wittering Formation	Sand	Some small areas in the north-east of the study area, in between areas of Wittering Formation (Sand, Silt and Clay)	No

Groundwater-surface water interactions (springs, sinks, karst, GWDTE)

2.2.128 Springs and seepages are likely to be present below and in the banks of local surface watercourses.

2.2.129 Springs in the area have not been mapped at scoping stage, and no data on any sinks, karst features or GWDTE (non-designated GWDTE; designated GWDTE noted in Designated sites section) in the area has been ascertained at this time. Data would be collated for future revisions of the HIA.

Groundwater levels

2.2.130 At this time no site-specific groundwater levels have been collated and reviewed for the area.

2.2.131 In addition to the proposed site investigation works, a number of EA groundwater monitoring installations are located within the study area, south of the corridor:

- EA monitoring well Portsdown BH
- EA monitoring well Pinsley Lodge
- EA monitoring well Downbarn Farm N Fare.

Groundwater flooding

2.2.132 Hampshire has a known history of groundwater flooding, with over 100 towns and villages across the county suffering significant flooding during the winter of 2000/2001.

2.2.133 Due to the significant groundwater flooding risk in the county, HCC has developed a groundwater management plan to identify the areas at risk and put in place measures to mitigate risk.

2.2.134 The groundwater flooding risk in the study area has not been assessed at this time. The risk of groundwater flooding is more likely in areas where the Chalk bedrock or permeable superficial deposits are observed.

Abstractions

2.2.135 Two licensed groundwater abstractions are located within the study, as documented in Table 2-26 below.

Table 2-26: Licensed groundwater abstractions

License Holder	License No.	Use	Point Name
Portsmouth Water Ltd	11/42/33.9/20	Public Water Supply	Maindell PS
Southwick Estate	11/42/33.5/5	Private Water Supply	Offwell Farm, Southwick

2.2.136 A surface water abstraction (Southwick Lake on the River Wallington – License No. 11/42/33.5/23) is located north of the preferred pipeline corridor, operated by Southwick Park Naval Recreational Centre Management Committee. The abstraction is utilised for direct spray irrigation in the summer months.

2.2.137 HBC, PCC and FBC were contacted in regard to unlicensed abstractions (<20 m3/day) within the area, but no data was available for the area.

2.2.138 WCC provided details on a number of licensed and unlicensed abstractions within their area. Two private water supplies were provided within the study area including:

- The Southwick Estate abstraction which is licensed (see Table 2-26)
- 1 & 2 The Cottage to the north of the Scoping Area adjacent to Wickham Common

2.2.139 Abstractions within the study area are illustrated in Figure 18.5 within Volume III.

Discharges

2.2.140 38 consented discharges are located within the study area, as documented in Table 2-27 below.

Table 2-27: Consented discharges

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
Mrs Wetherill	dcfs	Domestic property (single) (incl farm house)	Marling	Groundwater via a borehole
D Parrett	H01960	Undefined or other	Ashley Down Farm House	Freshwater river
Warings Contractors Ltd.	P02509	Undefined or other	Warings Contractors Ltd.	Into land
Southern Water Services Ltd	A01308	Storm tank/CSO on sewerage network (water company)	Newmans Bridge Southwick CSO	River Wallington
Knightsgate (UK) Ltd	Eprlp3225xg	Domestic property (single) (incl. farm house)	Plot 2 former Hoads Hill Service St	Trib of River Wallington
J Heath Esq.	H01544	Undefined or other	Purbrook Heath Farm	Freshwater river
Mr Nicholas Roberts	EPRDB3398EE	Domestic property (single) (incl farm house)	7 Forest Lane	Groundwater via borehole
Veolia es Hampshire Ltd	G01170	Waste collection/treatment/disposal/materials recovery	Warren Farm waste transfer station	Groundwater via soakaway
Southern Water Services Ltd	H01073	Pumping station on sewerage network (water company)	Sewage pumping station	Freshwater river
C D E Bazalgette	H01605	Undefined or other	Potwell house	Freshwater river
C G Poole	H01697	Undefined or other	Hook heath farm	Freshwater river
Knightsgate (uk) Ltd	EPRLP3226GV	Domestic property (single) (incl. farm house)	Plot 4 former Hoads Hill Service St	Trib of River Wallington
Royal Armouries	P02737	Domestic property (single) (incl. farm house)	Hampshire C.C.	Into land
Winchester City Council	P06856	Domestic property (single) (incl. farm house)	Field adjacent to No 1 Widley walk	Freshwater river
Mr D M Daniels	H01543	Domestic property (single) (incl. farm house)	Tudor cottage	Freshwater river

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
Southwick & Roche Court Estate Co.	N02579	Domestic property (single) (incl. farm house)	1 & 2 Ashley Down cottages	Into land
Veolia es Hampshire Ltd	G01169	Waste collection/ treatment/ disposal/materials recovery	Warren Farm Waste Transfer Station	Groundwater via soakaway
Southern water services Ltd	A01278	Pumping station on sewerage network (water company)	Westbrook Grove Purbrook CSO	Wallington river via drain
Knightsgate (uk) limited	EPRLP3226XT	Domestic property (single) (incl. farm house)	Plot 3 former Hoads Hill Service St	Trib of river Wallington
Veolia es Hampshire Ltd	G01172	Waste collection/treatment/disposal/materials recovery	Warren farm waste transfer station	Groundwater via soakaway
Exec's of Mrs E Borthwick-norton	H01607	Undefined or other	The Southwick estate	Freshwater river
Exec's of Mrs E Borthwick-norton	H01608	Undefined or other	The Southwick estate	Freshwater river
Veolia es Hampshire Ltd	G01171	Waste collection/treatment/disposal/materials recovery	Warren farm waste transfer station	Groundwater via soakaway
Southern water services ltd	A01017	Storm tank/CSO on sewerage network (water company)	Lone valley Waterlooville CSO	Tributary of river Wallington
Knightsgate (uk) limited	EPRJP3924XW	Domestic property (single) (incl. farm house)	Plot 1 former Hoads Hill Service st	Trib of river Wallington
Mr Stephen Spencer	EPRYP3825GE	Domestic property (single) (incl. farm house)	Birchfrith	Groundwater via borehole
Southern Water Services Ltd	W00248	WTW/sewage treatment works (water company)	Southwick WTW	River Wallington
Southern Water Services Ltd	A01308	Storm tank/CSO on sewerage network (water company)	Newmans Bridge Southwick CSO	River Wallington
Knightsgate UK Ltd	EPRNP3621XT	Domestic property (single) (incl. farm house)	Whitethorn	River Meon

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
SGC Projects Limited	EPRJP3726GP	Domestic property (single) (incl. farm house)	2 The Cottages	Ditch tributary of River Wallington
L Ross	EPRNP3622XF	Domestic property (single) (incl farm house)	Southern Cross	Wallington River
M R Stares Esq.	N03391	Domestic property (single) (incl farm house)	Dunroamin	Into Land
Royale Park Home Estates Ltd	N00023	Holiday Accom/Camp Site/Caravan Site/Hotel/Hostel	Wickham Court	Tributary of Wallington River
Mr & Mrs Longstaff	H01470	Domestic property (single) (incl farm house)	Danetree	Freshwater River
W Holdaway Esq	N03034	Domestic property (single) (incl farm house)	Winecross Farmhouse	Into land/ Infiltration system
T Copsey Esq	H01673	Undefined or other	Russells Place	Freshwater River
Mr A Bower	EPRHB3593VX	Domestic property (single) (incl farm house)	Meadow View/Trampers Lane STP	Surface Drain
Winchester City Council	P06370	WwTW (not water co) (not STP at a private premises)	Wine Cross Sewage Treatment Works	Tributary of the Wallington

2.2.141 Discharges within the study area are illustrated in Figure 18.5 within Volume III.

A32 to Shirrel Heath

Topography

2.2.142 The southern end of the study area is at an elevation of 30mOD rising north to a hill at 45mOD before plateauing at around 40mOD. Heading northward, the corridor descends to 15mOD and rises to 50mOD after crossing the River Meon. The preferred pipeline corridor then covers an area with elevation between 40mOD and 60mOD, straddling the top of a ridge between two river valleys, before descending into the northern valley and crossing it, down to 35mOD and then up to 65mOD at the most northern end.

Designated sites

2.2.143 SDNP is to the north-east of the corridor. Botley Wood and Everett's and Mushes Copses SSSI (a GWDTE) is to the west of the corridor.

2.2.144 The most south easterly 200m of the Scoping Area is located within SPZ3 associated with the Maindell PS abstraction south-east of the corridor. SPZ Zones 2 and 2c are within the study area, but Zone 1 is outside the study area.

2.2.145 Environmental designations along the preferred pipeline corridor are illustrated in Figure 8.1 within Volume III, with SPZs shown in Figure 18.5 within Volume III.

Surface watercourses

2.2.146 The study area includes a number of surface water catchment areas, as summarised in Table 2-28 below.

Table 2-28: Surface water catchments in study area

	Wallington below Southwick	Meon
Water Body ID	GB107042016360	GB107042016640
River Basin District	South East	South East
Hydromorphological Designation	Not Designated	Not Designated
Current Ecological	Moderate	Good
Current Chemical	Fail	Fail
Ecological Objective	Good	Good
Chemical Objective	Good	Good
Protected areas	Nitrates Directive, Shellfish Water Directive	Nitrates Directive, Conservation of Wild Birds Directive, Shellfish Water Directive

2.2.147 The River Meon is a Chalk stream, which rises at East Meon before flowing circa 34km in a generally south or south-westerly direction towards the sea. The corridor crosses the River Meon north of Knowle.

2.2.148 The Wallington is in the east of the study area (crossing the corridor in the land west of London Road (A3) to A32 area).

2.2.149 Surface water catchments and main rivers are illustrated in Figure 18.1 within Volume III.

Superficial deposits

2.2.150 Table 2-29 details the superficial geology in the study area.

Table 2-29: Superficial deposits in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
Alluvium	Clay, Silt, Sand and Gravel	Underlies the preferred pipeline corridor at the point the River Meon passes through the corridor. Alluvium is present within the study area along the River Meon which passes through north-east to south-west, and at the south-eastern end along the Wallington River.	Yes

Geology	Description	Location and prevalence	Mapped Within Corridor
River Terrace Deposits	Gravel, Sand and Silt	Underlies the preferred corridor for many parts of the north-south section of the corridor. Present along the River Meon which passes through north-east to south-west, and at the south-eastern end along the Wallington River.	Yes
Head	Clay, Silt, Sand and Gravel	Underlies the preferred corridor in the northern end in two places, alongside the River Meon at the crossing point. Some more areas within the study area of Head deposit coverage are in the west of the study area and extreme south-east.	Yes
No superficial cover		Half of the study area has no superficial cover. Most of the southern part of the corridor has no superficial cover.	Yes

Bedrock geology

2.2.151 Table 2-30 details the bedrock geology in the study area.

Table 2-30: Bedrock geology in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
Lambeth Group	Clay, Silt and Sand	Surrounds chalk members in the south of the study area. Underlies the preferred corridor in the southern end of the corridor, on the bend as the corridor heads north from the east.	Yes
London Clay Formation	Clay, Silt and Sand	Formation underlies preferred corridor in the northern end and a small area directly north of the northern part of Lambeth Group in the middle of the preferred corridor. Most of the eastern side of the study area is underlain with London Clay Formation, with a very small area on the southern edge and a small area in the west of the study area, west of the southern underlying part.	Yes
Bognor Sand Member	Sand	Very small area in the south of the study area.	No
Tarrant Chalk Member	Chalk	Underlies very small area in north of southern square of corridor, which extends a small distance within the study area.	Yes
Spetisbury Chalk Member	Chalk	Underlies most of the southern square of corridor and a small area as the corridor heads north. Formation extends east to the edge of the study area with an increasing band thickness from the square of corridor, and south to the edge of the study area from the crossing as the corridor heads north.	Yes

Geology	Description	Location and prevalence	Mapped Within Corridor
Portsdown Chalk Member	Chalk	Underlies southern edge of proposed corridor and extends for a larger area in south of study area.	Yes
Whitecliff Sand Member	Sand	Underlies preferred corridor in a small area of the middle of the corridor, and a couple of small areas in the north of the corridor. Surrounds the Wittering Formation and covers half of the northern end of the study area.	Yes
Wittering Formation	Sand, Silt and Clay	Preferred corridor crosses bands of the Wittering Formation 4 times in the northern half of the study area. Forms a large area in the lower half of the northern half of the study area.	Yes
Wittering Formation	Sand	Preferred corridor crosses bands of the Wittering Formation (Sand) twice in the northern half of the study area. This circular band underlies a small part of the wider study area in the lower half of the northern half of the study area.	Yes
Earnley Sand Formation	Sand, Silt and Clay	Forms an area in the lower half of the northern half of the study area, just under half of which underlies the preferred corridor, in the centre of the circular bands of Wittering Formation,	Yes

Groundwater-surface water interactions (springs, sinks, karst, GWDTE)

2.2.152 Springs and seepages are likely to be present below and in the banks of local surface watercourses.

2.2.153 Springs in the area have not been mapped at scoping stage, and no data on any sinks, karst features or GWDTE (non-designated GWDTE; designated GWDTE noted in Designated sites section) in the area has been ascertained at this time. Data would be collated for future revisions of the HIA.

Groundwater levels

2.2.154 At this time no site-specific groundwater levels have been collated and reviewed for the area.

2.2.155 In addition to the proposed site investigation works, an EA groundwater monitoring installation is located within the study area at the northern end of the corridor:

2.2.156 Frith Lane End Groundwater Monitoring BH.

Groundwater flooding

2.2.157 Hampshire has a known history of groundwater flooding, with over 100 towns and villages across the county suffering significant flooding during the winter of 2000/2001.

2.2.158 Due to the significant groundwater flooding risk in the county, HCC has developed a groundwater management plan to identify the areas at risk and put in place measures to mitigate risk.

2.2.159 The groundwater flooding risk in the study area has not been assessed at this time. The risk of groundwater flooding is more likely in areas where the Chalk bedrock or permeable superficial deposits are observed.

Abstractions

2.2.160 A single licensed groundwater abstraction is located within the study area, as documented in Table 2-31 below.

Table 2-31: Licensed groundwater abstractions

License Holder	License No.	Use	Point Name
Golfpartners International Limited	29/058/R01	Spray Irrigation - Direct	Borehole at Wickham Park Golf Club

2.2.161 Winchester County Council provided details on a number of licensed and unlicensed abstractions (<20 m3/d) within their area. Two unlicensed abstractions are located within the study area, as summarised below:

- Lone Cottage Unlicensed abstraction within SSSI to south-west of corridor.
- The Bungalow (now The Garden House) unlicensed abstraction west of corridor

2.2.162 Fareham Council were contacted in regards to unlicensed abstractions (<20 m3/day) within the area, but no data was available for the area.

2.2.163 Abstractions within the study area are illustrated in Figure 18.5 within Volume III.

Discharges

2.2.164 18 consented discharges are located within the study area of the A32 to Shirrel Heath corridor, as documented in Table 2-32 below.

Table 2-32: Consented discharges

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
Mrs Bev Wetherill	Eprgp3929xp	Domestic property (single) (incl. farm house)	Marling	Groundwater via a borehole
Knightsgate (uk) limited	Eprlp3225xg	Domestic property (single) (incl. farm house)	Plot 2 former Hoads Hill Service St	Trib of River Wallington
Mr David Crossley	H01930	Undefined or other	Double lodge	Freshwater river
Mr Nicholas Roberts	Eprdb3398ee	Domestic property (single) (incl farm house)	7 forest lane	Groundwater via borehole

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
Knightsgate (uk) limited	Eprlp3 226gv	Domestic property (single) (incl farm house)	Plot 4 former hoads hill service st	Trib of River Wallington
Albion water limited	Eprjb3 697ay	WTW/sewage treatment works (water company)	Knowle STW	River Meon
Albion water limited	H0051 5	Dentist/hospital/nursing home (medical)/human health	Knowle hospital	Unnamed trib of River Meon
Mr David Crossley	H0135 1	Undefined or other	Mayles lodge	Freshwater river
H L Gamblin & Sons	H0188 6	Undefined or other	Little Tapnage farm	Freshwater river
Mr David Crossley	H0192 8	Domestic property (single) (incl farm house)	Deer lodge	Freshwater river
J Potts esq	N0309 2	Domestic property (single) (incl farm house)	Mayles house	Into land
Mr Rob Davies	Eprlb3 797ra	Domestic property (single) (incl farm house)	Great pecks stp	Ditch leading to River Hamble
Knightsgate (uk) limited	Eprlp3 226xt	Domestic property (single) (incl farm house)	Plot 3 former Hoads Hill Service St	Trib of River Wallington
Southern Water Services Limited	A0130 9	Storm tank/CSO on sewerage network (water company)	Fareham road Wickham CSO	River Meon
Knightsgate (uk) limited	Eprjp3 924xw	Domestic property (single) (incl farm house)	Plot 1 former Hoads Hill Service St	Trib of River Wallington
Mr Stephen Spencer	Epryp 3825g e	Domestic property (single) (incl farm house)	Birchfrith	Groundwater via borehole
Mr David Crossley	H0193 1	Undefined or other	Northfields farm house	Freshwater river
Knightsgate uk limited	Eprnp 3621xt	Domestic property (single) (incl farm house)	Whitethorn	River Meon

2.2.165 Discharges within the study area are illustrated in Figure 18.5 within Volume III.

Shirrel Heath to Bishop's Waltham

Topography

2.2.166 The south-eastern end of the study area is at an elevation of 60mOD and the elevation of the southern half of the corridor undulates between 65mOD and 45mOD crossing two small streams. The corridor then descends to 20mOD

crossing the River Hamble before rising to 40mOD on the northern side of the river, following a tributary of the River Hamble north.

Designated sites

2.2.167 Waltham Chase Meadows SSSI (a GWDTE) is located north-east of the corridor.

2.2.168 SDNP is located at the northern tip of study area.

2.2.169 Bishops Waltham Branch Line and Claylands LNR are located to the north-east of the corridor at the north-west end of the corridor.

2.2.170 No SPZ's are located within the study area.

2.2.171 Environmental designations along the preferred pipeline corridor are illustrated in Figure 8.1 within Volume III, with SPZs shown in Figure 18.5 within Volume III.

Surface watercourses

The study area includes a number of surface water catchment areas, as summarised in Table 2-33 below.

Table 2-33: Surface water catchments in study area

	Main River Hamble	Moors Stream	Horton Heath Stream	Upper Hamble	Meon
Water Body ID	GB107042016250	GB107042016260	GB107042016270	GB107042016280	GB107042016640
River Basin District	South East	South East	South East	South East	South East
Hydromorphological Designation	Not Designated	Not Designated	Heavily Modified	Not Designated	Not Designated
Current Ecological	Moderate	Good	Good	Moderate	Good
Current Chemical	Fail	Fail	Fail	Fail	Fail
Ecological Objective	Moderate	Good	Good	Good	Good
Chemical Objective	Good	Good	Good	Good	Good
Protected areas	Nitrates Directive, Shellfish Water Directive, Urban Waste Water Treatment Directive	Nitrates Directive	Nitrates Directive	Nitrates Directive	Nitrates Directive, Conservation of Wild Birds Directive, Shellfish Water Directive

2.2.172 The proposed corridor crosses the Main River Hamble which flows south-west towards the coast. The Main River Hamble is formed from the confluence of the

Upper Hamble and Moors stream which is located just north-east of the Main River Hamble crossing (just outside the corridor).

2.2.173 Surface water catchments and main rivers are illustrated in Figure 18.1 within Volume III.

Superficial deposits

2.2.174 Table 2-34 details the superficial geology in the study area.

Table 2-34: Superficial deposits in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
Alluvium	Clay, Silt, Sand and Gravel	Alluvium underlies preferred corridor in locations where watercourses pass across the corridor. Within the study area, Alluvium is located along the River Hamble and its tributaries in the northern end of the study area, and along Shawfords Lake.	Yes
River Terrace Deposits	Gravel, Sand and Silt	Small area underlying the preferred corridor at the extreme northern end, and then in the north alongside the River Hamble. Some more area of cover within the study area in the north and on the western edge.	Yes
Head	Clay, Silt, Sand and Gravel	Head underlies preferred corridor in four distinct locations along the corridor, with larger areas of cover extending from the underlying locations to the south-western edge of the study area.	Yes
No superficial cover		Most of the preferred corridor has no superficial cover, most of the study area, especially the north-eastern side, has no superficial cover.	Yes

Bedrock geology

2.2.175 Table 2-35 details the bedrock geology in the study area.

Table 2-35: Bedrock geology in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
London Clay Formation	Clay, Silt and Sand	Covers most of the north of the proposed corridor and half of the remaining area. Underlies corridor for most of the northern third, and smaller amounts at 1/3 along from the south-eastern end.	Yes
London Clay Formation	Sand	A few very small areas in the north of the study area, two of which underly the proposed corridor.	Yes
Whitecliff Sand Member	Sand	Half of the southern half of the study area is underlain by Whitecliff Sand Member. The south-eastern end of the corridor and part of the	Yes

Geology	Description	Location and prevalence	Mapped Within Corridor
		middle of the study area is underlain by this formation.	
Wittering Formation	Sand, Silt and Clay	Small amount of the Wittering Formation underlies the preferred corridor in the middle of the corridor, this area extends to the west of the study area and is more prevalent than the Wittering Formation (Sand).	Yes
Wittering Formation	Sand	Small amount of the Wittering Formation underlies the preferred corridor in the middle of the corridor, this area extends to the west of the study area and is less prevalent than the Wittering Formation (Sand, Silt and Clay) – forming lots of small bands of Wittering Formation – Sand.	Yes
Lambeth Group	Clay, Silt and Sand	Very small area in extreme north of study area	No

Groundwater-surface water interactions (springs, sinks, karst, GWDTE)

2.2.176 Springs and seepages are likely to be present below and in the banks of local surface watercourses.

2.2.177 Springs in the area have not been mapped at scoping stage, and no data on any sinks, karst features or GWDTE (non-designated GWDTE; designated GWDTE noted in Designated sites section) in the area has been ascertained at this time. Data would be collated for future revisions of the HIA.

Groundwater levels

2.2.178 At this time no site-specific groundwater levels have been collated and reviewed for the area.

2.2.179 In addition to the proposed site investigation works, a number of EA groundwater monitoring installations are located within the study area:

- Frith Lane End Groundwater Monitoring BH at the eastern end of the study area
- Multiple groundwater monitoring BH's (Sandboils Sand, Sandboils Chalk, North Pond Bishops, Northbrook Bishops) at the northern end of the study area, proximal to the Upper Hamble

Groundwater flooding

2.2.180 Hampshire has a known history of groundwater flooding, with over 100 towns and villages across the county suffering significant flooding during the winter of 2000/2001.

2.2.181 Due to the significant groundwater flooding risk in the county, HCC has developed a groundwater management plan to identify the areas at risk and put in place measures to mitigate risk.

2.2.182 The groundwater flooding risk in the study area has not been assessed at this time. The risk of groundwater flooding is more likely in areas where the Chalk bedrock or permeable superficial deposits are observed.

Abstractions

2.2.183 No licensed groundwater abstractions are mapped within the study area.

2.2.184 A surface water abstraction is located within the study area that is utilised for agriculture/irrigation; River Hamble at Durley (License No. 11/42/25.2/54).

2.2.185 Winchester County Council provided details on a number of licensed and unlicensed abstractions (<20 m3/d) within their area. Unlicensed abstractions are located within the study area, as summarised below:

- The Bungalow (now The Garden House) unlicensed abstraction south-east of corridor
- Yewtree Cottage unlicensed abstraction north-east of corridor
- Woodmans Farm House unlicensed abstraction within corridor
- The Granary unlicensed abstraction south-west of corridor (proximal to Main River Hamble)

2.2.186 Abstractions within the study area are illustrated in Figure 18.5 within Volume III.

Discharges

2.2.187 12 consented discharges are located within the study area, as documented in Table 2-36 below.

Table 2-36: Consented discharges

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
Mrs E M Warwick	H01657	Undefined or other	Gravel Hill House	Freshwater river
Messrs F.J. Knowles & J.A. Geale	H01925	Undefined or other	Brooklands Farm House	Saline estuary
Mr Richard Daniel	Eprlp3125gc	Domestic property (single) (incl. farm house)	Spencer place	Unnamed trib Shawfords lake
Southern Water Services Ltd	W00006	WTW/sewage treatment works (water company)	Bishops Waltham WTW	The river hamble
Mr Paul Mifsud	Eprub3697ny	Domestic property (multiple) (incl. farm houses)	Middle Barn The Tree Nursery	Tributary of Shawfords lake
D m Gamblin	H01692	Undefined or other	Conifers	Freshwater river
Mr & Mrs Mclean	H01958	Undefined or other	Underwath	Saline estuary

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
Sandy Acres Girl Guide Group	Eprtb3392vc	Holiday accom/camp site/caravan site/hotel/hostel	Sandy Acres girl guide group STP	Tributary of Shawfords lake
M.m. Moore esq.	H02003	Domestic property (single) (incl farm house)	Premises at Curdridge lane	Freshwater river
Mrs Paula Hayward	Eprtb3393vn	Domestic property (single) (incl farm house)	Black Horse farm	Trib of Shawfords lake
Mrs Sarah Byfield	Eprsb3690wn	Domestic property (single) (incl farm house)	1 Lyons cottage	Ditch trib of Shawfords lake
C Morgan and sons (motors and spares) ltd	G00388	Warehousing + support activities for transportation	C Morgan and sons ltd	Shawford lake trib of Hamble

2.2.188 Discharges within the study area are illustrated in Figure 18.5 within Volume III.

Bishop's Waltham to Otterbourne

Topography

2.2.189 The south-eastern end of the study area is on the side of a small stream valley, with an elevation of 30mOD – 50mOD. At Wintershill, the corridor passes along the side of a hill, with a maximum elevation of 75mOD. Heading north-west, north of Fair Oak, the preferred corridor passes over a much flatter area with elevation between 30mOD and 45mOD. The north-western end of the corridor has elevation of 15mOD to 35mOD, passing over Hill's Farm at Brambridge (35mOD) and the River Itchen (15mOD).

Designated sites

2.2.190 The River Itchen in the west of the preferred pipeline corridor is a SSSI (a GWDTE) and SAC designated Chalk river.

2.2.191 The SDNP is located to the north-west of the corridor (immediately adjacent to the corridor where the corridor crosses Horton Heath Stream) and within the corridor at the western end.

2.2.192 Bishops Waltham Branch Line and Claylands LNR are located to the north-east of the corridor at the southern end of the corridor.

2.2.193 The corridor study area crosses a number of SPZs. At the eastern end, the study area slightly encroaches into a SPZ1c and SPZ2 related to the Portsmouth Water Northbrook groundwater abstractions (located outside the study area).

2.2.194 Moving west, the corridor crosses through a SPZ1c and 2c (east of Horton Heath stream) associated with the Portsmouth Water public water supply abstraction at Lower Upham. The SPZ1 is located just to the south-west of the corridor, with the SPZ2 present in the north-east towards the edge of the study area.

2.2.195 Travelling further westwards, the northern half of the corridor and study area moves into an SPZ1c associated with the numerous Chalk abstractions in the area. Where the underground pipeline begins to route northwards towards Otterbourne, the SPZ1c becomes an SPZ1.

2.2.196 Environmental designations along the preferred pipeline corridor are illustrated in Figure 8.1 within Volume III, with SPZs shown in Figure 18.5 within Volume III.

Surface watercourses

2.2.197 The study area includes a number of surface water catchment areas, as summarised in Table 2-37 below.

Table 2-37: Surface water catchments in study area

	Main River Hamble	Moors Stream	Horton Heath Stream	Upper Hamble	Monks Brook	Bow Lake	Itchen
Water Body ID	GB10704 2016250	GB10704 2016260	GB10704 2016270	GB10704 2016280	GB10704 2016310	GB10704 2016650	GB10704 20225
River Basin District	South East	South East	South East	South East	South East	South East	South East
Hydromorphological Designation	Not Designated	Not Designated	Heavily Modified	Not Designated	Heavily Modified	Not Designated	Not Designated
Current Ecological	Moderate	Good	Good	Moderate	Moderate	Bad	Good
Current Chemical	Fail	Fail	Fail	Fail	Fail	Fail	Fail
Ecological Objective	Moderate	Good	Good	Good	Good	Good	Good
Chemical Objective	Good	Good	Good	Good	Good	Good	Good
Protected areas	Nitrates Directive, Shellfish Water Directive, Urban Waste Water Treatment Directive	Nitrates Directive	Nitrates Directive	Nitrates Directive	Nitrates Directive	Nitrates Directive	Nitrates Directive, Drinking Water Protected Area, Urban Waste Water Treatment Directive, Shellfish Water Directive

2.2.198 The preferred pipeline corridor crosses a number of surface watercourses:

- River Itchen (a highly designated chalk stream) and Itchen Navigation
- Bow Lake
- Horton Heath stream
- Upper Hamble

2.2.199 Surface water catchments and main rivers are illustrated in Figure 18.1 within Volume III.

Superficial deposits

2.2.200 Table 2-38 details the superficial geology in the study area.

Table 2-38: Superficial deposits in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
Alluvium	Clay, Silt, Sand and Gravel	Small areas of cover in the south-east of the study area underlying the corridor, more cover around the River Itchen in the north-west of the study area, some of with underlies the corridor, and additional cover underlying the corridor 1/3 from the north-western end.	Yes
Tufa	Tufa, Calcareous	Very small area of Tufa underlying corridor at northern end, Tufa extends north along the river Itchen out of the study area.	Yes
River Terrace Deposits	Sand and Gravel	Underlies corridor in north-western end, near River Itchen. Additional area in the northern side of the centre of the study area.	Yes
River Terrace Deposits	Gravel, Sand and Silt	Small areas in the south-east of the study area.	No
Head	Clay, Silt, Sand and Gravel	Very small area underlying the corridor 1/3 from the north-western end. Small narrow bands of Head deposits on the north-eastern side of the study area.	Yes
Clay-With-Flints-Formation	Clay, Silt, Sand and Gravel	Very small area in the extreme north underlies the corridor, small amount of coverage in the north end of the study area. Wider coverage along the north-eastern edge of the study area.	Yes
No superficial cover		Most of the study area (other than north-western end of corridor) has no superficial cover. Nearly all of the corridor has no superficial cover.	Yes

Bedrock geology

2.2.201 Table 2-39 details the bedrock geology in the study area.

Table 2-39: Bedrock geology in study area

Geology	Description	Location and prevalence	Mapped Within Corridor
London Clay Formation	Clay, Silt and Sand	Covers most of the study area and nearly all of the proposed corridor, all but the northern end and very small areas along the corridor. Coverage extends south of the proposed corridor to the edge of the study area in the majority of places, but not very far north.	Yes
London Clay Formation	Sand	Very small area in south of study area.	No
Whitecliff Sand Member	Sand	Small amount of coverage along the southern edge of the study area.	No
Whitecliff Sand Member	Sand and Gravel	Very small area at extreme western end of study area.	No
Wittering Formation	Sand, Silt and Clay	Two isolated areas along the south-western edge of the study area.	No
Lambeth Group	Clay, Silt and Sand	Very small area at two locations along proposed corridor is underlain by this formation, with a larger area at the northern end of the study area. Thick band extends roughly parallel to the north of the preferred pipeline corridor for the entirety of the study area.	Yes
Lambeth Group	Sand	Underlies corridor in northern end, where it forms a band south for the Lambeth Group (Clay, Silt and Sand). There is another area on the north-eastern edge, towards the south-eastern end of the study area.	Yes
Durley Sand Member	Sand	Two very small areas on the south-western edge of the study area.	No
Nursling Sand Member	Clay, Silt and Sand	Very small area at extreme western end of study area.	No
Tarrant Chalk Member	Chalk	A small area in the northern end underlies the proposed corridor. This formation also is found on much of the north-eastern edge of the study area.	Yes
Culver Chalk Formation	Chalk	In the northern end of the study area, a very small amount underlies the proposed corridor.	Yes
Newhaven Chalk Formation	Chalk	North of the Culver Chalk Formation and Tarrant Chalk Member, in the extreme north of the study area.	No

Groundwater-surface water interactions (springs, sinks, karst, GWDTE)

2.2.202 Springs and seepages are likely to be present below and in the banks of local surface watercourses.

2.2.203 Springs in the area have not been mapped at scoping stage, and no data on any sinks, karst features or GWDTE (non-designated GWDTE; designated GWDTE noted in Designated sites section) in the area has been ascertained at this time. Data would be collated for future revisions of the HIA.

Groundwater levels

2.2.204 At this time no site-specific groundwater levels have been collated or reviewed for the area.

2.2.205 In addition to the proposed site investigation works, a number of EA groundwater monitoring installations are located within the study area:

2.2.206 Multiple groundwater monitoring BHs (Sandboils Sand, Sandboils Chalk, North Pond Bishops, Northbrook Bishops) at the south-eastern end of the study area, proximal to the Upper Hamble.

- Multiple groundwater monitoring BHs (Wintershill Tertiary, Wintershill Chalk) within the corridor at Winters Hill
- Durley Hall Road groundwater monitoring BH south-west of corridor
- Alma Lane groundwater monitoring BH south-east of corridor, proximal to Horton Heath Stream and Lower Upham abstraction
- Stakes Lane groundwater monitoring BH north-east of corridor
- Hatchley Lane groundwater monitoring BH within corridor
- Oakwood Copse groundwater monitoring BH north-west of corridor
- Twyford Moors groundwater monitoring BH north-east of corridor
- Highways Road groundwater monitoring BH at north-western end of study area

Groundwater flooding

2.2.207 Hampshire has a known history of groundwater flooding, with over 100 towns and villages across the county suffering significant flooding during the winter of 2000/2001.

2.2.208 Due to the significant groundwater flooding risk in the county, HCC has developed a groundwater management plan to identify the areas at risk and put in place measures to mitigate risk.

2.2.209 The groundwater flooding risk in the study area has not been assessed at this time. The risk of groundwater flooding is more likely in areas where the Chalk bedrock or permeable superficial deposits are observed.

Abstractions

2.2.210 Thirteen licensed groundwater abstractions are located within the study area, as documented in Table 2-40: Licensed groundwater abstractions below. Note that Otterbourne PS Point F is within the corridor.

Table 2-40: Licensed groundwater abstractions

License Holder	License No.	Use	Point Name
Portsmouth Water	11/42/25.2/50	Public Water Supply	Lower Upham
Fishers Pond Ltd	11/42/22.9/160	Agriculture – Fish Farm/Cress Pond Throughflow	Fishers Pond Point A
Fishers Pond Ltd	11/42/22.9/160	Agriculture – Fish Farm/Cress Pond Throughflow	Fishers Pond Borehole C
Hampshire Carp Hatcheries	SO/042/0031/030	Agriculture – Fish Farm/Cress Pond Throughflow	Bowlake Fish Farm Borehole at Point A
Southern Water Services	11/42/22.7/94	Environmental – Make-up or top up water	Otterbourne PS Point E
Southern Water Services	11/42/22.7/94	Environmental – Make-up or top up water	Otterbourne PS Point F
Southern Water Services	11/42/22.7/94	Public Water Supply	Otterbourne PS Point G
Southern Water Services	11/42/22.7/94	Environmental – Make-up or top up water	Otterbourne PS Point H
Southern Water Services	11/42/22.7/94	Environmental – Make-up or top up water	Otterbourne PS Point A
Southern Water Services	11/42/22.7/94	Environmental – Make-up or top up water	Otterbourne PS Point B
Southern Water Services	11/42/22.7/94	Environmental – Make-up or top up water	Otterbourne PS Point C
Southern Water Services	11/42/22.7/94	Environmental – Make-up or top up water	Otterbourne PS Point K
Southern Water Services	11/42/22.7/94	Environmental – Make-up or top up water	Otterbourne PS Point D

2.2.211 A number of licensed surface water abstractions are also located within the study area, as follows:

- License 11/42/25.2/54: Peter Taplin - River Hamble at Durley – For agriculture/irrigation
- License SO/042/0031/007: Fishers Pond Ltd – Point A, Marwell Manor Farm, Fishers Pond - Agriculture: Fish Farm/Cress Pond Throughflow

- License 31/090: Fishers Pond Ltd – Thompson Lane, Fishers Pond (Points A and B) - Agriculture: Fish Farm/Cress Pond Throughflow
- License 11/42/22.9/159: Fishers Pond Ltd – Trib of Bow Lake Stream at Fishers Pond - Agriculture: Fish Farm/Cress Pond Throughflow
- License 11/42/22.9/163: Patrick Haughton (T/A Hampshire Carp Hatcheries) – Bow Lake Stream at Stoke Common – Agriculture: Fish Farm/Cress Pond Throughflow
- License 31/110: Henry Russell – Black Dyke, Point A - Environmental: Transfer between sources
- License SO/042/0031/023: Mr D Bronks East Lodge Fisheries – Itchen Navigation at Brambridge - Environmental: Remedial River/Wetland Support (Transfer between sources)
- License 11/42/22.6/93: Southern Water Services – River Itchen at the Otterbourne Intake - Public Water Supply
- License SO/042/0031/020: Malms House Ltd – Lower Itchen Navigation at Shawford – Environmental: Non-remedial water/wetland support, Transfer between sources

2.2.212 WCC and EBC provided details on a number of licensed and unlicensed abstractions (<20 m3/d) within their area. Three unlicensed abstractions are located within the study area, as summarised below:

- Lowhill Farmhouse unlicensed abstraction within Scheme Area
- Marwell Manor unlicensed abstraction north-east of preferred pipeline corridor
- Stoke Park Farm unlicensed abstraction south-west of preferred pipeline corridor

2.2.213 Abstractions within the study area are illustrated in Figure 18.5 within Volume III.

Discharges

2.2.214 50 consented discharges are located within the study area, as documented in Table 2-41 below.

Table 2-41: Consented discharges

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
Southern Water Services Ltd	A01399	Pumping station on sewerage network (water company)	Ashton Corner CSO	Tributary of the River Hamble
Fishers Pond Limited	EPRAB 3296EX	Fish + aquaculture/fish farm/cress farm	Fish farm at Marwell pond	Trib of Bow Lake Stream
Mr Clive Paice	EPRBB 3796NS	Domestic property (single) (incl farm house)	Property at Kisatorari Stables	Groundwater
Mr Peter Jackson	EPRDB 3999D M	Domestic property (single) (incl farm house)	The Chilterns	Infiltration field

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
Mr Brian Butler	EPRDP 3325XB	Domestic property (single) (incl farm house)	Jardini	Tributary of Colden Common
Hazardous waste management limited	EPREB 3096RR	Offices admin + support	Otterbourne farm	Groundwater
Mr Peter Nash	EPREB 3193DB	Domestic property (single) (incl farm house)	Malmsmead	Discharged to ground
Mr Robert Eburn	EPREB 3198VU	Domestic property (single) (incl farm house)	The summerhouse	Groundwater
Mr James Marshall	EPREB 3299WH	Domestic property (single) (incl farm house)	Calvi	Groundwater
Mr Phiroz & Mrs Elizabeth Daruvalla	EPREB 3592NW	Domestic property (single) (incl farm house)	Greenlaw	Groundwater
Hideaway (lu) limited	EPREB 3594RB	Domestic property (multiple) (incl farm houses)	Torbay farm	Unnamed trib of Ford Lake
Mr Derek Blake	EPREB 3899DL	Domestic property (single) (incl farm house)	Chinook lodge	Groundwater
Miss Majorie Wells	EPRFB 3091NX	Domestic property (single) (incl farm house)	Bridle way	Groundwater
Dr Justin Turner	EPRFB 3390AY	Domestic property (single) (incl farm house)	Yi shui ge	Trib of Itchen Navigation
Dr Justin Turner	EPRFB 3390DP	Domestic property (single) (incl farm house)	Qing ya xi	Kingfisher stream
Mr Mike Baird	EPRHB 3994NK	Domestic property (single) (incl farm house)	Malms farm	River Itchen
Mrs Carol Salmon	EPRJB 3694NM	Domestic property (single) (incl farm house)	Nythfa	Tributary of Ford Lake river
Mr Richard Girdlestone	EPRLP 3422GC	Domestic property (single) (incl farm house)	Moat cottage	Unnamed trib River Itchen
Various names	EPRNB 3235AG	Fish + aquaculture/fish farm/cress farm	Bowlake fish farm	Bow lake & a trib of Bow lake
Swifts property limited	EPRUB 3299RY	Wholesale trade (not motor vehicles)	Swifts farm	Ditch trib of Fisher's Pond
Mr Leigh Knowles	EPRZP 3929XR	Domestic property (single) (incl farm house)	Laurel cottage	Trib of River Hamble
Mr N J Spencer	H01467	Domestic property (single) (incl farm house)	Rose tree cottage	Freshwater river
J. Pugh esq.	H01471	Domestic property (single) (incl farm house)	Arbour cottage	Freshwater river

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
H. Howe esq.	H01896	Domestic property (single) (incl farm house)	Oak tree cottage	Saline estuary
Messrs F.J. Knowles & J.A. Geale	H01925	Undefined or other	Brooklands farm house	Saline estuary
Sandyfields nurseries	H02504	Farms (not house)/crop + animal rearing/plant nursery	Sandyfields nursery	Into land
Messrs Pink & Arnold	H02836	Domestic property (single) (incl farm house)	Marwell manor	Freshwater river
R.B. Dunford & son	N01642	Undefined or other	Stoke Park farmhouse &	Underground strata
Mrs P J Walker	N02930	Domestic property (single) (incl farm house)	House at Upham Farm	Into land
Ms Diana Porter	N03013	Domestic property (single) (incl farm house)	Nutwood house	Into land
Mr Peter Wheeler	N03056	Domestic property (single) (incl farm house)	Timbers	Into land
Mrs Gillian Denly	N03057	Domestic property (single) (incl farm house)	Septic tank serving Mallards Point	Into land
Dr. A k Coleman	N03260	Domestic property (single) (incl farm house)	Dell copse	Into land
Mrs Susanne Spencer	NPSW QD003411	Domestic property (single) (incl farm house)	Lambs hill	To soakaway
Fishers Pond Limited	NPSW QD005981	Fish + aquaculture/fish farm/cress farm	Fishers pond fishery	A tributary of Bow lake
New Deeps Farm	P010526	Farms (not house)/crop + animal rearing/plant nursery	New Deeps farm	Into land
Brendoncare foundation	P01097	Undefined or other	The Old Parsonage	Freshwater river
Mr Michael West	P01146	Domestic property (single) (incl farm house)	Swimming pool at Iolanda	Into land
S.Hennessy esq.	P02918	Domestic property (single) (incl farm house)	Otterbourne grange	Into land
T.Clay esq.	P03199	Domestic property (single) (incl farm house)	Leylands farm	Into land
Priory cc 101 limited	P04382	Food+beverage services/café/restaurant/pub	The Queens Head	Freshwater river
The Meadows (Upham) Management Limited	P06216	WTW (not water co) (not stp at a private premises)	Upham Street STW	Underground strata

Consent Holder	Permit No.	Discharge Type	Discharge Site Name	Receiving Water
Edmund Nuttall ltd	P07187	Undefined or other	Edmund Nuttall ltd	Freshwater river
Southern Water Services Ltd	W00006	WTW/sewage treatment works (water company)	Bishops Waltham WTW	The River Hamble
Mr Chris Russell	EPREB 3199AH	Domestic property (single) (incl farm house)	Crantock	Groundwater
Mr Gary Little	NPSW QD005379	Domestic property (single) (incl farm house)	Avonmore	Groundwater via soakaway
Mr Ian Glenday	EPREB 3692NR	Domestic property (multiple) (incl farm houses)	Little Ropers	Groundwater
Mr Simon Allen	EPREB 3499VZ	Domestic property (single) (incl farm house)	Blencathra	Groundwater
Mr Andrew Bruce	EPREB 3496WK	Domestic property (single) (incl farm house)	Copthorne	Groundwater via soakaway
Mr Alvin Barrett	EPREB 3992VT	Domestic property (single) (incl farm house)	Combpyne	Groundwater via infiltration

2.2.215 Discharges within the study area are illustrated in Figure 18.5 within Volume III.

3 Conceptualisation

3.1.1 Based on the regional and local understanding documented in the previous sections, Table 3-1 to Table 3-9 below summarise the hydrogeological conceptualisation of each area. Cross sections through key trenchless sections of the preferred pipeline corridor are illustrated in Appendix A: Figure A1 to Figure A8.

Table 3-1: Conceptual model for proposed Water Recycling Plant

Model element	Study area description
Surface topography	Proposed WRP has elevation in the order of 5-15m AOD. Langstone Harbour located to the south of the Scoping Area at an elevation in the order of 2m AOD (submerged at high tide). General increase in topography to north towards Chalk Downs and steep increase to north-west towards Portsdown Hill Chalk Ridge.
WFD groundwater catchment	Underlain by East Hants Chalk (GB40701G502700) – Poor overall status
Main groundwater bodies	Superficial Deposits: Site underlain primarily by Raised Marine Deposits (secondary undifferentiated aquifer) with some River Terrace Deposits (secondary A aquifer) mapped towards the north. [Significant made ground/land fill on site. Landfill considered by Land quality and ground conditions topic] Bedrock: Site underlain by Chalk bedrock (principal aquifer).
Groundwater flow direction	Main groundwater table generally flowing south towards the sea. Some localised south-easterly groundwater flow from the Portsdown Hill possible. Localised flow in the superficials likely to be controlled by tidal interaction and surface watercourses.
Approximate groundwater level in Proposed Development study area	No groundwater levels collated to date. Groundwater level anticipated to be shallow or potentially flowing artesian in the area, due to the numerous springs. Tidal behaviour may be observed due to proximity to the sea.
Regional faults	No significant regional faults identified.
Surface water bodies	To the south of the site lies the Langstone Harbour Transitional Water Body. Langstone Harbour designated as a SSSI, SPA, Ramsar and SAC. Hermitage stream flows towards the sea on the eastern edge of the site.
Groundwater Abstractions Licenses (within 1km)	Portsmouth Water public water supply abstractions from the Bedhampton-Havant springs to the north of the proposed WRP site
SPZs	SPZ 1 located circa 350m north, associated with the Bedhampton-Havant abstractions noted above.
Groundwater -surface water	Numerous springs to the north of the site; the Bedhampton-Havant springs are utilised for public water supply and feed some of the minor watercourses in the area.

Model element	Study area description
Interactions (GWSWI)	Langstone Harbour to the south is designated as a groundwater dependent terrestrial ecosystem.
Recharge	Low permeability Palaeogene and urbanisation retard recharge in the area. Aquifer recharge predominantly anticipated to occur to north in the South Downs.

Table 3-2: Conceptual model for Proposed Underground Pipeline between Budds Farm Water Treatment Works and the proposed Water Recycling Plant (including the Budds Farm Water Treatment Works site)

Model element	Study area description
Surface topography	Relatively shallow topography (4-9m AOD), with higher elevations to the north-west of the alignment (around the proposed WRP).
WFD groundwater catchment	Underlain by East Hants Chalk (GB40701G502700) – Poor overall status.
Main groundwater bodies	Superficial Deposits: Site underlain by Raised Marine Deposits (secondary undifferentiated aquifer), beach and tidal flat deposits (secondary undifferentiated aquifer) and alluvium (secondary A aquifer). [Landfill to be considered by Land quality and ground conditions topic] Bedrock: Site underlain by Chalk bedrock (principal aquifer).
Groundwater flow direction	Main groundwater table generally flowing south towards the sea. Localised flow in the superficials likely to be controlled by tidal interaction and surface watercourses.
Approximate groundwater level in Proposed Development study area	No groundwater levels collated to date. Groundwater level in the Chalk anticipated to be shallow or potentially flowing artesian in the area, due to the numerous springs. Tidal behaviour may be observed due to proximity to the sea.
Regional faults	No significant regional faults identified.
Surface water bodies	The Proposed Underground Pipeline passes through the Langstone Harbour transitional water body. The underground pipeline crosses beneath the Hermitage stream which flows south into Langston Harbour.
Groundwater Abstractions Licenses (within 1km)	Portsmouth Water public water supply abstractions from the Bedhampton-Havant springs to the north of the proposed WRP site
SPZs	SPZ 1 located circa 550m north, associated with the Bedhampton-Havant abstractions noted above.
GWSWI	Numerous springs to the north of the site; the Bedhampton-Havant springs are utilised for public water supply and feed some of the minor watercourses in the area. Langstone Harbour to the south is designated as a groundwater dependent terrestrial ecosystem. Scoping Area partly encroaches onto designated site.
Recharge	Low permeability Palaeogene and urbanisation retard recharge in the area. Aquifer recharge predominantly anticipated to occur to north in the South Downs.

Table 3-3: Conceptual model for Proposed Underground Pipeline between the proposed Water Recycling Plant and Havant Thicket Reservoir

Model element	Study area description
Surface topography	Fall in elevation from the northern end of the underground pipeline towards Havant (Chichester Syncline), an increase in elevation (Portsdown anticline) before falling again towards the coast (Hampshire basin).
WFD groundwater catchment	At southern end, underlain by East Hants Chalk (GB40701G502700) – Poor overall status. As travels north, goes into South Hants Lambeth Group (GB40702G503700) – Good overall status. Northern half of preferred pipeline corridor not within WFD groundwater catchment (within unproductive London Clay)
Main groundwater bodies	Superficial Deposits: Preferred pipeline corridor underlain by Head (secondary undifferentiated aquifer), River Terrace Deposits (secondary A aquifer), Alluvium (secondary A aquifer), Raised Marine Deposits (secondary undifferentiated), as well as areas with no superficial cover. [Landfill considered by Land quality and ground conditions topic] Bedrock: Preferred pipeline corridor underlain by Chalk bedrock (principal aquifer) in the south. Moving north the preferred pipeline corridor is underlain by Lambeth Group (secondary A) and London Clay (predominantly unproductive, with some granular bands designated secondary A)
Groundwater flow direction	Main groundwater table generally flowing south towards the sea. Localised flow in the superficials likely to be controlled by tidal interaction (in the south) and surface watercourses.
Approximate groundwater level in Proposed Development study area	No groundwater levels collated to date. Groundwater level in the Chalk anticipated to be shallow or potentially flowing artesian in the southern part of the alignment, due to the numerous springs in the area. Variable groundwater levels are anticipated in the superficial deposits, as well as the Lambeth Group and London Clay deposits, with a general trend of higher groundwater levels towards the north. Tidal behaviour may be observed towards the south due to proximity to the sea.
Regional faults	No significant regional faults identified.
Surface water bodies	Much of the underground pipeline alignment is within the Hermitage Stream catchment, with the underground pipeline crossing beneath the stream north-east of Barncroft Way.
Groundwater Abstractions Licenses (within 1km)	Portsmouth Water public water supply abstractions from the Bedhampton-Havant springs to the east of the preferred pipeline corridor, in the southern half of the alignment.
SPZs	The underground pipeline is situated within a SPZ1 and SPZ1c (within London Clay deposits overlying the Chalk SPZ) for the majority of the preferred pipeline corridor, with the exception of the most southern 500m. This SPZ is associated with the Portsmouth Water public water supply abstractions noted above.
GWSWI	Numerous springs in the Bedhampton-Havant area. Langstone Harbour to the south is designated as a groundwater

Model element	Study area description
	dependent terrestrial ecosystem. Limited groundwater-surface water interactions anticipated in the northern half of the preferred pipeline corridor, due to the anticipated low permeability of the underlying geology.
Recharge	Low permeability Palaeogene and urbanisation retard recharge in the area. Aquifer recharge predominantly anticipated to occur to north in the South Downs.

Table 3-4: Conceptual model for proposed Water Recycling Plant to proposed land west of London Road (A3) (northern pipeline corridor)

Model element	Study area description
Surface topography	Shallow topography at the south-eastern end of the northern pipeline corridor (circa 10m AOD), before rising steeply to circa 60m AOD) in the area of the Portsdown Hill Chalk ridge.
WFD groundwater catchment	In east, underlain by East Hants Chalk (GB40701G502700) – Poor overall status. As travels north, goes into South Hants Lambeth Group (GB40702G503700) – Good overall status. Northern half of northern pipeline corridor not within WFD groundwater catchment (within unproductive London Clay)
Main groundwater bodies	Superficial Deposits: Northern pipeline corridor underlain by Head (secondary undifferentiated aquifer), River Terrace Deposits (secondary A aquifer), and Raised Marine Deposits (secondary undifferentiated), as well as areas with no superficial cover (predominantly in the north-west). [Landfill considered by Land quality and ground conditions topic] Bedrock: Northern pipeline corridor underlain by Chalk bedrock (principal aquifer) in the south. Moving north the northern pipeline corridor is underlain by Lambeth Group (secondary A) and London Clay (predominantly unproductive, with some granular bands designated secondary A). Underground pipeline anticipated to be predominantly within the Chalk.
Groundwater flow direction	Main groundwater table generally flowing south towards the sea. Localised flow in the superficials likely to be controlled by tidal interaction (in the south) and surface watercourses.
Approximate groundwater level in Proposed Development study area	No groundwater levels collated to date. Groundwater level in the Chalk anticipated to be shallow or potentially flowing artesian in the southern part of the alignment, due to the numerous springs in the area. Chalk in the Portsdown Hill area is likely to be deeper, due to the topography, and is likely to be more susceptible to seasonal and rainfall variations. Variable groundwater levels are anticipated in the superficial deposits, as well as the Lambeth Group and London Clay deposits, with a general trend of higher groundwater levels towards the north. Tidal behaviour may be observed towards the south due to proximity to the sea.
Regional faults	No significant regional faults identified.
Surface water bodies	The underground pipeline alignment is within the catchment of Potwell Tributary and the coast. No surface water bodies are crossed by the underground pipeline alignment.

Model element	Study area description
Groundwater Abstractions Licenses (within 1km)	Portsmouth Water public water supply abstractions from the Bedhampton-Havant springs to the east of the northern pipeline corridor, at the eastern end of the alignment.
SPZs	The underground pipeline is situated within a SPZ for approximately half of the alignment (from the middle to the north-western end). This SPZ is associated with the Portsmouth Water public water supply abstractions noted above.
GWSWI	Numerous springs in the Bedhampton-Havant area, north-east of the proposed WRP end of the northern pipeline corridor. Langstone Harbour to the south of the eastern end of the alignment is designated as a GWDTE.
Recharge	Low permeability Palaeogene and urbanisation retard recharge in the area. Aquifer recharge predominantly anticipated to occur to north in the South Downs, although some localised recharge of the Chalk may occur on Portsdown Hill.

Table 3-5: Conceptual model for proposed Water Recycling Plant to proposed land west of London Road (A3) (southern pipeline corridor)

Model element	Study area description
Surface topography	From the proposed WRP the ground elevation increases from circa 10m AOD to 50m AOD over a relatively short distance, before a more gradual increase to 90m AOD. The topography then falls to circa 50m AOD at the northern end. The higher topography corresponds to Portsdown Hill.
WFD groundwater catchment	Underlain by East Hants Chalk (GB40701G502700) – Poor overall status. North-west of southern pipeline corridor within South Hants Lambeth Group (GB40702G503700) – Good overall status, and London Clay (not designated a WFD groundwater catchment).
Main groundwater bodies	Superficial Deposits: Southern pipeline corridor underlain by Head (secondary undifferentiated aquifer), River Terrace Deposits (secondary A aquifer), and Raised Marine Deposits (secondary undifferentiated), as well as areas with no superficial cover (predominantly in the north-west). [Landfill considered by Land quality and ground conditions topic] Bedrock: Southern pipeline corridor underlain by Chalk bedrock (principal aquifer) in the south. Moving north the southern pipeline corridor is underlain by Lambeth Group (secondary A) and London Clay (predominantly unproductive, with some granular bands designated secondary A). Underground pipeline anticipated to be predominantly within the Chalk.
Groundwater flow direction	Main groundwater table generally flowing south towards the sea. Localised flow in the superficials likely to be controlled by tidal interaction (in the south) and surface watercourses. Infiltration into the Portsdown Hill Chalk may locally influence groundwater flow directions, particularly during wetter periods.
Approximate groundwater level in Proposed	No groundwater levels collated to date. Groundwater level in the Chalk anticipated to be shallow or potentially flowing artesian in the southern part of the alignment, due to the numerous springs in the area. Chalk in the

Model element	Study area description
Development study area	Portsdown Hill area is likely to be deeper, due to the topography, and is likely to be more susceptible to seasonal and rainfall variations. Variable groundwater levels are anticipated in the superficial deposits, as well as the Lambeth Group and London Clay deposits, with a general trend of higher groundwater levels towards the north. Tidal behaviour may be observed towards the south due to proximity to the sea.
Regional faults	No significant regional faults identified.
Surface water bodies	The underground pipeline alignment is within the catchment of Potwell Tributary and the coast. No surface water bodies are crossed by the underground pipeline alignment.
Groundwater Abstractions Licenses	Portsmouth Water public water supply abstractions from the Bedhampton-Havant springs to the east of the southern pipeline corridor, at the eastern end of the alignment.
SPZs	The underground pipeline is situated within a SPZ1 for only the most northern 150m of the underground pipeline alignment. This SPZ is associated with the Portsmouth Water public water supply abstractions noted above.
GWSWI	Numerous springs in the Bedhampton-Havant area, north-east of the proposed WRP end of the southern pipeline corridor. Langstone Harbour to the south of the eastern end of the alignment is designated as a groundwater dependent terrestrial ecosystem. Portsdown SSSI is circa 400m south-west of the underground pipeline alignment where it diverts northwards near the A3. The site is a Chalk Grassland Habitat, although not designated a GWDTE.
Recharge	Low permeability Palaeogene and urbanisation retard recharge in the area. Aquifer recharge predominantly anticipated to occur to north in the South Downs, although some localised recharge of the Chalk may occur on Portsdown Hill.

Table 3-6: Conceptual model for land west of London Road (A3) to A32 Road

Model element	Description
Surface topography	The topography along the preferred pipeline corridor undulates with a general fall from east to west.
WFD groundwater catchment	Preferred pipeline corridor generally underlain by East Hants Chalk (GB40701G502700) – Poor overall status. Close to Chalk-Lambeth boundary, with preferred pipeline corridor occasionally underlain by South Hants Lambeth Group (GB40702G503700) – Good overall status,
Main groundwater bodies	Superficial Deposits: Corridor underlain by Head (secondary undifferentiated aquifer), River Terrace Deposits (secondary A aquifer) and Alluvium (secondary A aquifer), as well as large areas with no superficial cover. Bedrock: Corridor underlain by Chalk bedrock (principal aquifer), Lambeth Group (secondary A) and London Clay (predominantly unproductive, with some granular bands designated secondary A).

Model element	Description
Groundwater flow direction	Main groundwater table generally flowing south towards the sea. Localised flow in the superficials likely to be controlled by topography and surface watercourses (e.g. flow towards the Wallington).
Approximate groundwater level in Proposed Development study area	No groundwater levels collated to date. Variable groundwater levels are anticipated in the superficial deposits, with a general trend of higher groundwater levels towards the north.
Regional faults	No significant regional faults identified.
Surface water bodies	The preferred pipeline corridor lies within the catchment of Potwell Tributary and the catchment of Wallington below Southwick. The Wallington River is crossed in the west of the corridor.
Groundwater Abstractions Licenses (within 1km)	Portsmouth Water public water supply abstraction Maindell PS is located to the south of the corridor on the western end of the preferred pipeline corridor. Private water supply abstraction located at Offwell Farm, Southwick within the centre of the corridor
SPZs	The preferred pipeline corridor crosses the SPZ2 and SPZ3 associated with the Maindell public water supply abstraction to the south of the corridor.
GWSWI	A number of springs are anticipated in the study area. Hook Heath Meadows SSSI and Lye Heath Marsh SSSI are located to the north of the corridor, adjacent to Potwell Tributary. Both of these are designated GWDTE. Portsdown SSSI is circa 400m south-west of the underground pipeline alignment where it diverts northwards near the A3. The site is a Chalk Grassland Habitat, although not designated a GWDTE.
Recharge	Low permeability Palaeogene and urbanisation retard recharge in the area. Aquifer recharge predominantly anticipated to occur to north in the South Downs.

Table 3-7: Conceptual model for A32 to Shirrel Heath

Model element	Description
Surface topography	The topography along the preferred pipeline corridor undulates as it crosses river valleys.
WFD groundwater catchment	South-east of preferred pipeline corridor underlain by East Hants Chalk (GB40701G502700) – Poor overall status. As moves north, small section of preferred pipeline corridor is underlain by South Hants Lambeth Group (GB40702G503700) – Good overall status, Majority of northern half of preferred pipeline corridor underlain by South East Hants Bracklesham Group (GB40702G503000) – Poor overall status.
Main groundwater bodies	Superficial Deposits: Corridor underlain by Head (secondary undifferentiated aquifer), River Terrace Deposits (secondary A aquifer) and Alluvium (secondary A aquifer), as well as large areas with no superficial cover. Bedrock: Corridor underlain by Chalk bedrock (principal aquifer), Lambeth Group (secondary A), Bracklesham Group (secondary A) and London Clay

Model element	Description
	(predominantly unproductive, with some granular bands designated secondary A).
Groundwater flow direction	Main groundwater table generally flowing south towards the sea. Localised flow in the superficials likely to be controlled by topography and surface watercourses (e.g. flow towards the Meon).
Approximate groundwater level in Proposed Development study area	No groundwater levels collated to date. Variable groundwater levels are anticipated in the superficial deposits and low permeability bedrock, with a general trend of higher groundwater levels towards the north.
Regional faults	No significant regional faults identified.
Surface water bodies	The preferred pipeline corridor lies within the catchment of Wallington below Southwick and the catchment of Meon. The preferred pipeline corridor crosses the River Meon; a Chalk stream which flows south-westerly towards the sea.
Groundwater Abstraction Licenses (within 1km)	Licensed abstraction borehole at Wickham Park Golf Club utilised for irrigation at eastern edge of corridor. Two unlicensed abstractions (Lone Cottage and The Bungalow) are located within the study area, but outside the corridor.
SPZs	The eastern extent of the preferred pipeline corridor is within the SPZ3 of the Maindell PS abstraction.
GWSWI	A number of springs are anticipated in the study area. Botley Wood and Everett's and Mushes Copses SSSI is located to the west of the corridor where the Meon trenchless crossing is proposed. The SSSI is designated as a GWDTE.
Recharge	Low permeability Palaeogene and urbanisation retard recharge in the area. Aquifer recharge predominantly anticipated to occur to north in the South Downs.

Table 3-8: Conceptual model for Shirrel Heath to Bishop's Waltham

Model element	Description
Surface topography	Undulating topography with a general decrease towards the Hamble before rising again.
WFD groundwater catchment	Preferred pipeline corridor underlain by London Clay (non-designated WFD groundwater body) and South East Hants Bracklesham Group (GB40702G503000) – Poor overall status.
Main groundwater bodies	Superficial Deposits: Corridor underlain by Head (secondary undifferentiated aquifer), River Terrace Deposits (secondary A aquifer) and Alluvium (secondary A aquifer), as well as large areas with no superficial cover. Bedrock: Corridor underlain by Bracklesham Group (secondary A) and London Clay (predominantly unproductive, with some granular bands designated secondary A).
Groundwater flow direction	Main groundwater table generally flowing south towards the sea. Localised flow in the superficials and bedrock likely to be controlled by topography and surface watercourses (e.g., flow towards the Hamble).

Model element	Description
Approximate groundwater level in Proposed Development study area	No groundwater levels collated to date. Variable groundwater levels are anticipated in the superficial deposits and low permeability bedrock, with a general trend of higher groundwater levels towards the north.
Regional faults	No significant regional faults identified.
Surface water bodies	The preferred pipeline corridor crosses a number of surface water catchments including the Main River Hamble, Moors Stream, Horton Heath Stream, Upper Hamble and Meon. The preferred pipeline corridor crosses the Main River Hamble which flows south-westerly.
Groundwater Abstractions Licenses (within 1km)	No licensed abstractions are mapped within the study area. Three unlicensed abstractions (Yewtree Cottage, The Granary and The Bungalow) are located within the study area, but outside the corridor. Unlicensed abstraction Woodmans Farm House located within the extent of the corridor
SPZs	None in area.
GWSWI	A number of potential springs are anticipated in the study area. Waltham Chase Meadows SSSI is located north-east of the corridor, and is designated as a GWDTE.
Recharge	Low permeability Palaeogene and urbanisation retard recharge in the area. Aquifer recharge predominantly anticipated to occur to north in the South Downs.

Table 3-9: Conceptual model for Bishop's Waltham to Otterbourne

Model element	Description
Surface topography	The topography undulates as the preferred pipeline corridor passes along the side of hills, before lowering in the area of the River Itchen.
WFD groundwater catchment	Majority of preferred pipeline corridor underlain by London Clay (not designated WFD groundwater body). Small section underlain by East Hants Lambeth Group (GB40702G500800) – Good overall status. In west, towards Otterbourne, underlain by Central Hants Lambeth Group (GB40702G503800 – Good overall status) and River Itchen Chalk (GB40701G505000 – Poor overall status)
Main groundwater bodies	Superficial Deposits: Corridor underlain by Tufa, Head (secondary undifferentiated aquifer), River Terrace Deposits (secondary A aquifer) and Alluvium (secondary A aquifer), Clay with Flints (unproductive) as well as large areas with no superficial cover. Bedrock: Corridor underlain by Chalk (principal aquifer), Lambeth Group (secondary A) and London Clay (predominantly unproductive, with some granular bands designated secondary A).
Groundwater flow direction	Main groundwater table generally flowing south towards the sea. Localised flow in the superficials and bedrock likely to be controlled by topography, abstractions, and surface watercourses.
Approximate groundwater level	No groundwater levels collated to date.

Model element	Description
in Proposed Development study area	Variable groundwater levels are anticipated in the superficial deposits and low permeability bedrock, with a general trend of higher groundwater levels towards the north. Groundwater levels in the Chalk are anticipated to be shallow and influenced by the local groundwater abstractions and surface watercourses.
Regional faults	No significant regional faults identified.
Surface water bodies	The preferred pipeline corridor crosses a number of surface water catchments including the Main River Hamble, Moors Stream, Horton Heath Stream, Upper Hamble, Monks Brook, Bow Lake and Itchen. The preferred pipeline corridor crosses a number of watercourses including the environmentally designated River Itchen and Itchen Navigation Bow Lake, Horton Heath Stream and the Upper Hamble (twice).
Groundwater Abstractions Licenses (within 1km)	A number of licensed abstractions are located within the study area including nine Southern Water abstractions around Otterbourne, the Portsmouth Water Lower Upham public water supply abstraction, and a number of agricultural abstractions (Fishers Pond Point A, Fishers Pond Borehole C and Bowlake Fish Farm Borehole at Point A). Two unlicensed abstractions are also noted within the study area including Lowhill Farmhouse (within the corridor extents) and Marwell Manor (north-east of the corridor).
SPZs	The corridor crosses a number of SPZs, including a SPZ1c and 2c east of Horton Heath Stream associated with the Portsmouth Water public water supply abstraction at Lower Upham. Moving further west, the corridor lies partly within SPZ1c and 2c zones associated with the numerous Chalk abstractions in the area (including Southern Water's Otterbourne abstractions). As the underground pipeline begins to route northwards, the SPZ1c becomes an SPZ1.
GWSWI	A number of potential springs are anticipated in the study area, primarily in the north-west around the Itchen. The River Itchen in the west of the preferred pipeline corridor is a SSSI and SAC designated Chalk river and GWDTE.
Recharge	Low permeability Palaeogene and urbanisation retard recharge in the area. Aquifer recharge predominantly anticipated to occur to the north in the South Downs.

4 Preliminary assessment of impacts

4.1 Construction impacts

4.1.1 A summary of the main construction impacts that are to be considered within the Preliminary HIA are summarised below.

Direct disturbance of groundwater

4.1.2 Construction activities have the potential to directly impact upon the water quantity and quality of the groundwater bodies identified, together with other hydraulically linked receptors. Direct effects on the quantitative and chemical WFD parameters for the underlying groundwater bodies are possible.

4.1.3 Disturbance could occur from the proposed construction activities including the installation of the buried pipelines and associated infrastructure along the preferred pipeline corridor. Any temporary groundwater control, if required, for tunnel or pipeline construction would cause drawdown of the local water table resulting in reduced groundwater levels, which could impact groundwater dependent receptors (e.g. streams, abstractions, springs or GWDTE) within the zone of influence.

4.1.4 Direct disturbance could also occur from unplanned events (e.g. accidental release of drilling fluid during tunnelling operations).

Supply of contaminants to groundwater

4.1.5 The operation of construction machinery has the potential to accidentally release lubricants, fuels and oils on to the ground which could migrate into the underlying groundwater. This could also be caused by spillage, leakage and in-wash from vehicle storage areas following rainfall, accidental release of foul waters (e.g., from welfare facilities) and construction materials, such as concrete, grout and inert drilling fluids from trenchless crossings or tunnelling.

4.1.6 Any activities that disturb the ground, such as excavation, tunnelling or piling, could discharge contaminants below ground and potentially adversely affect groundwater quality or locally alter the hydraulic properties of the aquifer, which may in turn impact groundwater dependent features such as abstraction points or GWDTEs. (Note that mobilisation of contaminants following disturbance of contaminated ground or groundwater, or through uncontrolled site runoff in areas impacted by contamination is not considered within this assessment).

Changes to groundwater flow paths

4.1.7 Groundwater flows and levels may be impacted by temporary physical modifications (e.g. excavations, tunnelling or infilling followed by compaction), which would interrupt the natural groundwater flow pathways.

4.1.8 Below ground infrastructure installed below the water table has the potential to permanently act as a barrier to flow, leading to mounding upstream of the feature which could result in groundwater flooding upstream or drawdown impacts downstream. Conversely infrastructure installed below the groundwater table may

act as a preferential pathway creating connections between currently hydraulically disconnected aquifers and/or receptors. This has the potential to impact upon the quality and quantity of receptors.

4.2 Operational impacts

4.2.1 A summary of the main operational impacts that are to be considered within the Preliminary HIA are summarised below.

Supply of contaminants to groundwater

4.2.2 There is the potential for accidental release of contaminants to groundwater during planned and unplanned operational maintenance. Activities could lead to accidental release of fine sediment, treatment chemicals, oils, fuels and lubricants to groundwater bodies and associated receptors.

4.2.3 Leakage of water from/into the pipeline(s) or associated infrastructure could also impact the groundwater quality, particularly if the leakages are large or long term.

Changes to groundwater flows

4.2.4 Permanent above ground infrastructure is likely to increase the impermeable area across the catchments. This could decrease infiltration rates and permanently change surface runoff pathways impacting recharge of the underlying aquifers.

4.2.5 Once constructed the underground infrastructure will not have any further effect on groundwater flows to those assessed during the construction phase, and as such will be considered in the construction impacts assessment.

4.3 Receptor value

4.3.1 The importance or value (hereafter referred to as value) assigned to receptors has been determined with reference to ‘Table 3.70’ of DMRB LA 113, whereby value is assigned based on the quality indicators of a receptor. It should be noted that ‘value’ in this context has the same definition and use as ‘importance’ does within DMRB LA 113. To align with other chapters within the Environmental Impact Assessment, the values range from High to Very Low (within Table 3.70 of LA 113 the values range from Very High to Low).

4.3.2 Table 4-1below documents all potential groundwater receptors identified within the Proposed Development study area, together with their assigned value and location(s).

4.3.3 Minor watercourses (non-WFD) have been excluded at this stage of the assessment; this would be revisited as additional baseline data, site specific data and surveys become available. Groundwater flooding has also been excluded as this would be assessed separately within the Flood Risk Assessment document.

Table 4-1: Receptor value (very low to high)

Receptor	Value	Value Rationale	Location(s)	Notes
Aquifer - Principal Bedrock (White Chalk Subgroup)	High	Principal aquifer providing regionally important resource and baseflow to numerous designated sites.	Underlying parts of the Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW and the various underground pipeline alignments from the proposed WRP.	
Aquifer - Secondary A Bedrock Aquifer (Bracklesham Group)	Medium	Permeable layers capable of supporting water supplies at a local scale.	Underlying parts of the Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW.	
Aquifer - Secondary A Bedrock Aquifer (Lambeth Group)	Medium	Permeable layers capable of supporting water supplies at a local scale.	Underlying parts of Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW and from the proposed WRP to Havant Thicket Reservoir.	
Aquifer - Secondary A Bedrock Aquifer (London Clay Sand Members)	Medium	Permeable layers capable of supporting water supplies at a local scale.	Underlying parts of the Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW.	
Aquifer - Secondary A Superficial Deposits Aquifer (Alluvium)	Medium	Permeable layers capable of supporting water supplies at a local scale.	Underlying parts of the Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW in association with surface watercourses.	
Aquifer - Secondary A Superficial Deposits Aquifer (River Terrace Deposits)	Medium	Permeable layers capable of supporting water supplies at a local scale.	Underlying parts of the Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW, in association with surface watercourses.	

Receptor	Value	Value Rationale	Location(s)	Notes
Aquifer - Secondary Undifferentiated Superficial Deposits Aquifer (Beach and Tidal Flat Deposits)	Medium	Aquifer providing supply to local agriculture or industry, with limited connection to surface watercourses.	Underlying parts of the Proposed Underground Pipeline between Budds WTW and the proposed south of the proposed WRP.	
Aquifer - Secondary Undifferentiated Superficial Deposits Aquifer (Head)	Medium	Aquifer providing supply to local agriculture or industry, with limited connection to surface watercourses.	Underlying parts of the Proposed Underground Pipeline between the proposed WRP and Otterbourne WSW; predominantly in the eastern half of the Proposed Development	
Aquifer - Secondary Undifferentiated Superficial Deposits Aquifer (Raised Marine Deposits)	Medium	Aquifer providing supply to local agriculture or industry, with limited connection to surface watercourses.	Underlying parts of the Proposed Development in the area of the proposed WRP.	
Aquifer – Unproductive Bedrock Aquifer (London Clay)	Very Low	Unproductive Aquifer		
Consented Discharge	Low	A00751: Southern Water Services - Budds Farm WTW - To the Solent/Langstone Harbour		
Consented Discharge	Low	A00752: Southern Water Services - Budds Farm Havant CSO - To Brockhampton Creek		
Consented Discharge	Low	A01016: Southern Water Services - Priorsdean Crescent Havant CSO - To Hermitage Steam		
Consented Discharge	Low	A01017: Southern Water Services - Lone Valley Waterlooville CSO - To Tributary of River Wallington		

Receptor	Value	Value Rationale	Location(s)	Notes
Consented Discharge	Low	A01278: Southern Water Services Ltd - Westbrook Grove Purbrook - To Wallington River via Drain		
Consented Discharge	Low	A01308: Southern water services limited. - Newmans Bridge Southwick CSO - To River Wallington		
Consented Discharge	Low	A01309: Southern Water Services Ltd - Fareham Road Wickham CSO - To River Meon		
Consented Discharge	Low	A01399: Southern Water Services Ltd - Ashton Corner CSO - To tributary of the River Hamble		
Consented Discharge	Low	APRJB3697AY: Albion Water Ltd - Knowle STW - To River Meon		
Consented Discharge	Low	EPRAB3296EX: Fishers Pond Limited - Fish Farm at Marwell Pond - To tributary of Bow Lake Stream		
Consented Discharge	Low	EPRBB3796NS: Mr Clive Paice - Property at Kisatorari Stables - To groundwater		
Consented Discharge	Low	EPRDB3398CC: Mr Nicholas Roberts - 7 Forest Lane - To groundwater vis borehole		
Consented Discharge	Low	EPRDB3398EE: Nicholas Roberts - 7 Forest Lane - To groundwater via borehole		
Consented Discharge	Low	EPRDB3999DM: Mr Peter Jackson - The Chilterns - To infiltration field		

Receptor	Value	Value Rationale	Location(s)	Notes
Consented Discharge	Low	EPRDP3325XB: Mr Brian Butler - Jardini - To tributary of Colden Common		
Consented Discharge	Low	EPREB3096RR: Hazardous Waste Management Ltd - Otterbourne Farm - To groundwater		
Consented Discharge	Low	EPREB3193DB: Mr Peter Nash - Malmsmead - To ground		
Consented Discharge	Low	EPREB3198VU: Mr Robert Eburn - The Summerhouse - To groundwater		
Consented Discharge	Low	EPREB3299WH: Mr James Marshall - Calvi - To groundwater		
Consented Discharge	Low	EPREB3592NW: Mr Phiroz & Mrs Elizabeth Daruvalla - Greenlaw - To groundwater		
Consented Discharge	Low	EPREB3594RB: Hideaway (lu) Ltd - Torbay Farm - To unnamed tributary of Ford Lake		
Consented Discharge	Low	EPREB3899DL: Mr Derek Blake - Chinook Lodge - To groundwater		
Consented Discharge	Low	EPRFB3091NX: Miss Majorie Wells - Bridle Way - To groundwater		
Consented Discharge	Low	EPRFB3390AY: Dr Justin Turner - Yi Shui Ge - Tributary of Itchen Navigation		
Consented Discharge	Low	EPRFB3390DP: Dr Justin Turner - Qing Ya Xi - To Kingfisher Stream		
Consented Discharge	Low	EPRGP3929XP: Mrs Wetherill - Marling - To groundwater via borehole		

Receptor	Value	Value Rationale	Location(s)	Notes
Consented Discharge	Low	EPRHB3994NK: Mr Mike Baird - Malms Farm - To River Itchen		
Consented Discharge	Low	EPRJB3694NM: Mrs Carol Salmon - Nythfa - To tributary of Ford Lake River		
Consented Discharge	Low	EPRJP3924XW: Knightsgate (uk) limited - Plot 1 Former Hoads Hill Service St - To tributary of River Wallington		
Consented Discharge	Low	EPRKP3924XW: Knightsgate (UK) Ltd - Plot 1 Former Hoads Hill Service St - To tributary of River Wallington		
Consented Discharge	Low	EPRLB3797RA: Rob Davies - Great Pecks STP - To ditch leading to River Hamble		
Consented Discharge	Low	EPRLP3125GC: Mr Richard Daniel - Spencer place - To unnamed tributary of Shawfords lake		
Consented Discharge	Low	EPRLP3225XG: Knightsgate (UK) Ltd - Plot 2 Former Hoads Hill Services St - To Tributary of River Wallington		
Consented Discharge	Low	EPRLP3226GV: Knightsgate (UK) Ltd - Plot 4 Former Hoads Hill Service St - To tributary of River Wallington		
Consented Discharge	Low	EPRLP3226XT: Knightsgate (UK) Ltd - Plot 3 Former Hoads Hill Service St - To tributary of River Wallington		
Consented Discharge	Low	EPRLP3422GC: Mr Richard Girdlestone - Moat Cottage - Unnamed tributary of River Itchen		

Receptor	Value	Value Rationale	Location(s)	Notes
Consented Discharge	Low	EPRNB3235AG: Various Names - Bowlakes Fish Farm - To Bow Lake and tributary of Bow Lake		
Consented Discharge	Low	EPRNP3621XT: Knightsgate UK Ltd. - Whitethorn - To River Meon		
Consented Discharge	Low	EPRSB3690WN: Mrs Sarah Byfield - 1 Lyons Cottage - To ditch tributary of Shawfords Lake		
Consented Discharge	Low	EPRTB3392VC: Sandy Acres Girl Guide Group - Sandy Acres Girl Guide Group STP - To tributary of Shawfords Lake		
Consented Discharge	Low	EPRTB3393VN: Mrs Paula Hayward - Black Horse Farm - To tributary of Shawfords Lake		
Consented Discharge	Low	EPRUB3299RY: Swifts Property Ltd - Swifts Farm - To ditch tributary of Fisher's Pond		
Consented Discharge	Low	EPRUB3697NY: Mr Paul Mifsud - Middle Barn The Tree Nursery - To tributary of Shawfords Lake		
Consented Discharge	Low	EPRYP3825GE: Mr Stephen Spencer - Birchfrith - To groundwater via borehole		
Consented Discharge	Low	EPRYP3825GE: Stephen Spencer - Birchfrith - To groundwater via borehole		
Consented Discharge	Low	EPRZP3929XR: Mr Leigh Knowles - Laurel Cottage - To tributary of River Hamble		
Consented Discharge	Low	G00388: C Morgan and Sons (Motors and Spares) Ltd - C Morgan and Sons		

Receptor	Value	Value Rationale	Location(s)	Notes
		Ltd - To Shawford Lake tributary of Hamble		
Consented Discharge	Low	G01169: Veolia es Hampshire ltd - Warren Farm Waste Transfer Station - To groundwater via soakaway		
Consented Discharge	Low	G01170: Veolia es Hampshire limited - Warren Farm Waste Transfer Station - To groundwater via soakaway		
Consented Discharge	Low	G01172: Veolia es Hampshire ltd - Warren Farm Waste Transfer Station - To groundwater via soakaway		
Consented Discharge	Low	H00515: Albion Water Ltd - Knowle Hospital - To unnamed tributary of River Meon		
Consented Discharge	Low	H01073: Southern water services ltd - Sewage Pumping Station - To freshwater river		
Consented Discharge	Low	H01351: David Crossley - Mayles Lodge - To freshwater river		
Consented Discharge	Low	H01467: Mr N J Spencer - Rose Tree Cottage - To freshwater river		
Consented Discharge	Low	H01471: J. Pugh Esq. - Arbour Cottage - To freshwater river		
Consented Discharge	Low	H01543: Mr D M Daniels - Tudor Cottage - To Freshwater River		
Consented Discharge	Low	H01544: J Heath Esq - Purbrook Heath Farm - To Freshwater River		
Consented Discharge	Low	H01605: C D E Bazalgette - Potwell House - To freshwater river		

Receptor	Value	Value Rationale	Location(s)	Notes
Consented Discharge	Low	H01607: Exec's of Mrs E Borthwick-Norton - The Southwick Estate - To Freshwater River		
Consented Discharge	Low	H01608: Exec's of Mrs E Borthwick-Norton - The Southwick Estate - To Freshwater River		
Consented Discharge	Low	H01657: Mrs E M Warwick - Gravel Hill House - To freshwater river		
Consented Discharge	Low	H01692: D M Gamblin - Conifers - To freshwater river		
Consented Discharge	Low	H01697: C G Poole - Hook heath farm - To freshwater river		
Consented Discharge	Low	H01886: H L Gamblin & Sons - Little Tapnage Farm - To freshwater river		
Consented Discharge	Low	H01896: H Howe Esq. - Oak Tree Cottage - To saline estuary		
Consented Discharge	Low	H01925: Messrs F.J. Knowles & J.A. Geale - Brooklands Farm House - To saline estuary		
Consented Discharge	Low	H01928: David Crossley - Deer Lodge - To freshwater river		
Consented Discharge	Low	H01930: David Crossley - Double Lodge - To Freshwater River		
Consented Discharge	Low	H01931: David Crossley - Northfields Farm House - To freshwater river		
Consented Discharge	Low	H01958: Mr and Mrs Mclean - Underwath - To saline estuary		
Consented Discharge	Low	H01960: D Parrett - Ashley Down Farm House - To freshwater river		

Receptor	Value	Value Rationale	Location(s)	Notes
Consented Discharge	Low	H02003: M. M. Moore Esq - Premises at Curdridge Lane - To freshwater River		
Consented Discharge	Low	H02504: Sandyfields Nurseries - Sandyfields Nursery - To land		
Consented Discharge	Low	H02836: Messrs Pink and Arnod - Marwell Manor - To freshwater river		
Consented Discharge	Low	N01162: Fasset Limited - Langstone Road - To Freshwater River		
Consented Discharge	Low	N01265: North Shore Yacht Yards Ltd - Boshampton Lane - To Saline Estuary		
Consented Discharge	Low	N01642: R B Dunford & Son - Stoke Park Farmhouse - To underground strata		
Consented Discharge	Low	N02579: Southwick & Roche Court Estate co - 1 & 2 Ashley Down Cottages - To land		
Consented Discharge	Low	N02930: Mrs P J Walker - House at Upham Farm House - Into land		
Consented Discharge	Low	N03013: Ms Diana Porter - Nutwood House - Into land		
Consented Discharge	Low	N03056: Mr Peter Wheeler - Timbers - Into land		
Consented Discharge	Low	N03057: Mrs Gillian Denly - Septic tank serving Mallards Point - Into land		
Consented Discharge	Low	N03092: J Potts Esw - Mayles House - To land		
Consented Discharge	Low	N03260: Dr A K Coleman - Dell Copse - Into land		

Receptor	Value	Value Rationale	Location(s)	Notes
Consented Discharge	Low	NPSWQD003411: Mrs Susanne Spencer - Lambs Hill - To soakaway		
Consented Discharge	Low	NPSWQD005981: Fishers Pond Ltd - Fishers Pond Fishery - To a tributary of Bow Lake		
Consented Discharge	Low	P00174: De La Rue Systems - High Technology Campus - To Freshwater River		
Consented Discharge	Low	P010526: New Deeps Farm - New Deeps Farm - Into land		
Consented Discharge	Low	P01097: Brendoncare Foundation - The Old Parsonage - To freshwater river		
Consented Discharge	Low	P01146: Mr Michael West - Swimming Pool at Iolanda - Into land		
Consented Discharge	Low	P02509: Warings Contractors Ltd - Warings Contractors ltd - To Land		
Consented Discharge	Low	P02737: Royal armouries - Hampshire c.c. - To land		
Consented Discharge	Low	P02918: S Hennessy Esq - Otterbourne Grange - Into land		
Consented Discharge	Low	P03199: T Clay Esq - Leylands Farm - Into land		
Consented Discharge	Low	P04382: Priory CC 101 Ltd - The Queens Head - To freshwater river		
Consented Discharge	Low	P05514: Scottish and Southern Energy PLC - Land East of Southmoor Lane - To unnamed Tributary of Lavant Stream		

Receptor	Value	Value Rationale	Location(s)	Notes
Consented Discharge	Low	P06216: The Meadows (Upham) Management Ltd - Upham Street STW - To underground strata		
Consented Discharge	Low	P06856: Winchester City Council - Field Adj to No 1 Widley Walk - To Freshwater River		
Consented Discharge	Low	P07187: Edmund Nuttall Ltd - Edmund Nuttall Ltd - To freshwater river		
Consented Discharge	Low	P10535: Lift and Shift Skip Hire Ltd - Farlington Redoubt - To Land		
Consented Discharge	Low	W00006: Southern Water Services Ltd - Bishops Waltham WTW - To River Hamble		
Consented Discharge	Low	W00248: Southern water services ltd - Southwick WTW - To River Wallington		
Consented Discharge	Low	EPRJP3726GP: SGC Projects Ltd – 2 The Cottages – To ditch tributary of River Wallington		
Consented Discharge	Low	EPRNP3622XF: L Ross – Southern Cross – To Wallington River		
Consented Discharge	Low	N03391: M R Stares Esq – Dunroamin – Into Land		
Consented Discharge	Low	N00023: Royale Park Home Estates Ltd – Wickham Court – To tributary of Wallington River		
Consented Discharge	Low	H01470: Mr & Mrs Longstaff – Danetree – To Freshwater River		
Consented Discharge	Low	N03034: W Holdaway Esq – Winecross Farmhouse – Into land/ Infiltration system		

Receptor	Value	Value Rationale	Location(s)	Notes
Consented Discharge	Low	H01673: T Copsey Esq – Russells Place – To freshwater river		
Consented Discharge	Low	EPRHB3593VXL: Mr A Bower – Meadow View/Trampers Lane STP – To surface drain		
Consented Discharge	Low	P06370: Winchester City Council – Wine Cross Sewage Treatment Works – To tributary of the Wallington River		
Consented Discharge	Low	EPREB3199AH: Mr C Russell – Crantock – To groundwater		
Consented Discharge	Low	NPSWQD005379: Mr G Little – Avonmore – To groundwater		
Consented Discharge	Low	EPREB3692NR: Mr I Glenday – Little Ropers – To groundwater		
Consented Discharge	Low	EPREB3499VZ: Mr S Allen – Blencathra – To groundwater		
Consented Discharge	Low	EPREB3496WK: Mr A Bruce – Copthorne – To groundwater		
Consented Discharge	Low	EPREB3992VT: Mr A Barrett – Combpyne – To groundwater		
Designated Site - Botley Wood and Everett and Mushes Copses SSSI	High	Designated SSSI - Noted as GWDTE.	West of corridor in A32 to Shirrel Heath area	
Designated Site - Hook Heath Meadows SSSI	High	Designated SSSI - Noted as GWDTE.	North of corridor adjacent to Potwell Tributary in proposed Break Pressure Tank to A32 area	
Designated Site - Lye Heath Marsh SSSI	High	Designated SSSI - Noted as GWDTE.	North of corridor adjacent to Potwell Tributary in proposed Break Pressure Tank to A32 area	

Receptor	Value	Value Rationale	Location(s)	Notes
Designated Site - Portsdown SSSI	High	Designated SSSI - Not designated GWDTE.	Within study area of proposed WRP to land west of London Road (A3) and then to A32	Chalk Grassland Habitat
Designated Site - Waltham Chase Meadows SSSI	High	Designated Site of SSSI - Noted as GWDTE.	North-east of Shirrel Heath to Bishop's Waltham study area	
GWSWI - Sinks	Medium	Potential sinks	Within study area	
GWSWI - Springs	High	Bedhampton and Havant Springs (locally important public water supply)	In Bedhampton and Havant area	
GWSWI - Springs	Medium	Potential springs	Within study area	Springs that feed GWDTE or provide significant baseflow may be of high value
GWWSI – GWDTE	High	Potential GWDTE		
Licensed Abstraction – Groundwater (GW)	Medium	Southwick Estate - Offwell Farm, Southwick (Private Water Supply)	Within study area for proposed BPT to A32	
Licensed Abstraction - GW	Medium	Golfpartners International Limited - Borehole at Wickham Park Golf Club (Spray Irrigation)	Within study area for A32 to Shirrel Heath	
Licensed Abstraction - GW	Medium	Fishers Pond Ltd - Fishers Pond Point A (Agriculture - Fish Farm/Cress Pond Throughflow)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - GW	Medium	Fishers Pond Ltd - Fisher Pond Borehole C (Agriculture - Fish Farm/Cress Pond Throughflow)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - GW	Medium	Hampshire Carp Hatcheries - Bowlake Fish Farm Borehole at Point A (Agriculture - Fish Farm/Cress Pond Throughflow)	Within study area for Bishop's Waltham to Otterbourne	

Receptor	Value	Value Rationale	Location(s)	Notes
Licensed Abstraction - GW	High	Portsmouth Water - Bedhampton PS Spring No 1 (Public Water Supply)	Within study area for proposed WRP and preferred pipeline corridors from the proposed WRP to Budds Farm WTW and Havant Thicket Reservoir .	
Licensed Abstraction - GW	High	Portsmouth Water - Bedhampton PS Spring No 2 (Public Water Supply)	Within study area for proposed WRP and preferred pipeline corridors from the proposed WRP to Budds Farm WTW and Havant Thicket Reservoir .	
Licensed Abstraction - GW	High	Portsmouth Water - Havant PS (Public Water Supply)	Within study area for proposed WRP and preferred pipeline corridors from the proposed WRP to Budds Farm WTW and Havant Thicket Reservoir .	
Licensed Abstraction - GW	High	Portsmouth Water - Maindell PS(Public Water Supply)	Within study area for land west of London Road (A3) to A32	
Licensed Abstraction - GW	High	Portsmouth Water - Lower Upham (Public Water Supply)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - GW	High	Southern Water Services - Otterbourne PS Point E (Environmental Make-up or top-up water)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - GW	High	Southern Water Services - Otterbourne PS Point F (Environmental Make-up or top-up water)	Within Bishop's Waltham to Otterbourne preferred pipeline corridor	
Licensed Abstraction - GW	High	Southern Water Services - Otterbourne PS Point G (Public Water Supply)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - GW	High	Southern Water Services - Otterbourne PS Point H (Environmental Make-up or top-up water)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - GW	High	Southern Water Services - Otterbourne PS Point A (Environmental Make-up or top-up water)	Within study area for Bishop's Waltham to Otterbourne	

Receptor	Value	Value Rationale	Location(s)	Notes
Licensed Abstraction - GW	High	Southern Water Services - Otterbourne PS Point B (Environmental Make-up or top-up water)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - GW	High	Southern Water Services - Otterbourne PS Point C (Environmental Make-up or top-up water)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - GW	High	Southern Water Services - Otterbourne PS Point K (Environmental Make-up or top-up water)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - GW	High	Southern Water Services - Otterbourne PS Point D (Environmental Make-up or top-up water)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction – Surface Water (SW)	Medium	11/42/33.5/23: Southwick Park Naval Recreational Centre Management Committee - Southwick Lake on the River Wallington (Spray Irrigation)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - SW	Medium	11/42/25.2/54: Peter Taplin - River Hamble at Durley (Agriculture/Irrigation)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - SW	Medium	11/42/22.9/159: Fishers Pond Ltd - Trib of Bow Lake Stream at Fishers Pond (Agriculture - Fish Farm/Cress Pond Throughflow)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - SW	Medium	31/090: Fishers Pond Ltd - Thompson Lane, Fishers Pond (Points A and B) (Agriculture - Fish Farm/Cress Pond Throughflow)	Within study area for Bishop's Waltham to Otterbourne	
Licensed Abstraction - SW	Medium	11/42/22.9/163: Hampshire Carp Hatcheries - Bow Lake Stream at Soke Common (Agriculture - Fish Farm/Cress Pond Throughflow)	Within study area for Bishop's Waltham to Otterbourne	

Receptor	Value	Value Rationale	Location(s)	Notes
Licensed Abstraction - SW	High	31/110: Henry Russell - Black Dyke, Point A (Environmental - Transfer between sources)	Within study area for Bishop's Waltham to Otterbourne	To be confirmed dependent on what transfer is supporting.
Licensed Abstraction - SW	High	SO/042/0031/023: East Lodge Fisheries - Itchen Navigation at Brambridge (Environmental - Remedial River/Wetland Support [Transfer between sources])	Within study area for Bishop's Waltham to Otterbourne	To be confirmed dependent on what transfer is supporting.
Licensed Abstraction - SW	High	SO/042/0031/020: Malms House Ltd - Lower Itchen Navigation at Shawford (Environmental - Non-remedial water/wetland support [Transfer between sources])	Within study area for Bishop's Waltham to Otterbourne	To be confirmed dependent on what transfer is supporting.
Licensed Abstraction - SW	High	11/42/22.6/93: Southern Water Services - River Itchen At the Otterbourne Intake (Public Water Supply)	Within study area for Bishop's Waltham to Otterbourne	
SPZ - SPZ1 and SPZ1c	High	SPZ related to Bedhampton-Havant Springs PWS	Crossed by proposed WRP to Havant Thicket Reservoir and proposed WRP to land west of London Road (A3) preferred pipeline corridors	
SPZ - SPZ1 and SPZ1c	High	SPZ related to Maindell PWS	Within study area of land west of London Road (A3) to A32	
SPZ - SPZ1 and SPZ1c	High	SPZ related to Northbrook PWS	Within Bishop's Waltham to Otterbourne study area.	
SPZ - SPZ1 and SPZ1c	High	SPZ related to Lower Upham PWS	Crossed by preferred pipeline corridor in Bishop's Waltham to Otterbourne Scoping Area.	
SPZ - SPZ1 and SPZ1c	High	SPZ related to Fisher Pond Commercial Abstraction	Within Bishop's Waltham to Otterbourne study area.	

Receptor	Value	Value Rationale	Location(s)	Notes
SPZ - SPZ1 and SPZ1c	High	SPZ related to Otterbourne PWS	Crossed by preferred pipeline corridor in Bishop's Waltham to Otterbourne Scoping Area.	
SPZ - SPZ2 and SPZ2c	High	SPZ related to Maindell PWS	Crossed by preferred pipeline corridor in land west of London Road (A3) to A32 Scoping Area	
SPZ - SPZ2 and SPZ2c	High	SPZ related to Northbrook PWS	Within Bishop's Waltham to Otterbourne study area.	
SPZ - SPZ2 and SPZ2c	High	SPZ related to Lower Upham PWS	Crossed by preferred pipeline corridor in Bishop's Waltham to Otterbourne Scoping Area.	
SPZ - SPZ2 and SPZ2c	High	SPZ related to Otterbourne PWS	Crossed by preferred pipeline corridor in Bishop's Waltham to Otterbourne Scoping Area.	
SPZ - SPZ3	Medium	SPZ related to Maindell PWS	Crossed by preferred pipeline corridor in land west of London Road (A3) to A32 and A32 to Shirrel Heath Scheme Areas.	
Surface water body - Bow Lake	Medium	WFD Classified Watercourse.	Crossed by preferred pipeline corridor in Bishop's Waltham to Otterbourne Scoping Area.	
Surface water body - Hermitage Stream	Medium	WFD Classified Watercourse	Within study area of proposed WRP and Proposed Underground Pipeline to Budds Farm WTW. Crossed by proposed WRP to Havant Thicket Reservoir preferred pipeline corridor.	
Surface water body - Horton Heath Stream	Medium	WFD Classified Watercourse.	Crossed by preferred pipeline corridor in Bishop's Waltham to Otterbourne Scoping Area.	

Receptor	Value	Value Rationale	Location(s)	Notes
Surface water body - Itchen and Itchen Crossing	High	Protected WFD Classified Water Body - SAC, SSSI. Noted as GWDTE.	Crossed by preferred pipeline corridor in Bishop's Waltham to Otterbourne Scoping Area.	
Surface water body - Langstone Harbour	High	Protected WFD Transitional Water Body - SSSI, SPA, Ramsar, SAC. Noted as GWDTE.	South of proposed WRP, within study area.	
Surface water body - Lavant (Hants)	Medium	WFD Classified Watercourse	Within study area of underground pipelines from proposed WRP to Havant Thicket Reservoir and Budds Farm WTW (eastern extent)	
Surface water body - Main River Hamble	Medium	WFD Classified Watercourse.	Crossed by preferred pipeline corridor in Shirrel Heath to Bishop's Waltham Scheme Area	
Surface water body - Moors Stream	Medium	WFD Classified Watercourse.	Within study area of Shirrel Heath to Bishop's Waltham and Bishop's Waltham to Otterbourne	
Surface water body - Potwell Tributary	Medium	WFD Classified Watercourse	Within study area of proposed WRP to land west of London Road (A3) and then to A32	
Surface water body - River Meon	High	WFD Classified Watercourse.	Crossed by preferred pipeline corridor in A32 to Shirrel Heath Scheme Area	River Meon subject to S.20 Compensation under the SW drought plan. Sections of compensation would be protected as if they were SAC by NE. Long term desire from NE to designate

Receptor	Value	Value Rationale	Location(s)	Notes
				the River Meon as SAC.
Surface water body - Upper Hamble	Medium	WFD Classified Watercourse.	Potentially crossed by preferred pipeline corridor in Bishop's Waltham to Otterbourne Scheme Area.	
Surface water body - Upper Wallington	Medium	WFD Classified Watercourse	Within study area of land west of London Road (A3) to A32	
Surface water body - Wallington below Southwick	Medium	WFD Classified Watercourse	Within study area of land west of London Road (A3) to A32 and A32 to Shirrel Heath. Trenchless crossing of the Wallington in land west of London Road (A3) to A32 Scheme Area.	
Unlicensed abstraction – GW	Low	Stoke Park Farm Private Water Supply	Within the Proposed Development study area for Bishop's Waltham to Otterbourne	Eastleigh District Council
Unlicensed abstraction - GW	Low	Long Cottage Private Water Supply	Within the Proposed Development study area for A32 to Shirrel Heath	Winchester Council
Unlicensed abstraction - GW	Low	The Bungalow (now the Garden House) Private Water Supply	Within the Proposed Development study area for A32 to Shirrel Heath and Shirrel Heath to Bishop's Waltham	Winchester Council
Unlicensed abstraction - GW	Low	Yewtree Cottage Private Water Supply	Within the Proposed Development study area for Shirrel Heath to Bishop's Waltham	Winchester Council
Unlicensed abstraction - GW	Low	Woodmans Farm House Private Water Supply	Within Shirrel Heath to Bishop's Waltham Scheme Area	Winchester Council
Unlicensed abstraction - GW	Low	The Granary Private Water Supply	Within the Proposed Development study area for Shirrel Heath to Bishop's Waltham	Winchester Council
Unlicensed abstraction - GW	Low	Lowhill Farmhouse Private Water Supply	Within Bishop's Waltham to Otterbourne Scheme Area	Winchester Council

Receptor	Value	Value Rationale	Location(s)	Notes
Unlicensed abstraction - GW	Low	Marwell Manor Private Water Supply	Within the Proposed Development study area for Bishop's Waltham to Otterbourne	Winchester Council

4.4 Receptor impacts

4.4.1 The approach used to assess magnitude of impacts on water environment features considers the potential change to the receptors. This includes the severity of the impact, together with the vulnerability of the receptor to change. The magnitude of impact is assigned based on the criteria outlined in Table 4-2 below (based on Table 3.71 of DMRB LA113).

Table 4-2: Estimating magnitude of impact on an attribute

Magnitude	Summary
Major Adverse	Permanent/irreversible, or large-scale changes, over the whole receptor affecting usability or value. Causes fundamental changes to key features of the receptor's character or distinctiveness. Water resources Permanent changes to geomorphology and/or hydrology that prevent natural processes operating Permanent and/or wide scale effects on water quality or availability Permanent loss or long-term degradation of a water supply source resulting in prosecution Permanent or wide scale degradation of habitat quality
Moderate Adverse	Partial loss or noticeable change over the majority of the receptor, and/or discernible alteration to key features of the receptor's character or distinctiveness. Moderate permanent or long-term reversible change affecting usability or value over the medium- term or local area. Water resources Medium-term effects on water quality or availability Medium-term degradation of a water supply source, possibly resulting in prosecution Habitat change over the medium-term
Minor Adverse	Discernible temporary change over a minority of the receptor, and/or with minimal effect on usability, risk or value. Also, potential discernible alteration to key features of the receptor's character or distinctiveness. Water resources Short-term or local effects on water quality or availability Short-term degradation of a water supply source Habitat change over the short-term
Negligible	Temporary change, undiscernible over the medium- to long-term, with no effect on usability or value. Slight, or no, alteration to the characteristics or features of the receptor's character or distinctiveness. Water resources

Magnitude	Summary
	Intermittent impact on local water quality or availability Intermittent or no degradation of a water supply source Very slight local changes to habitat that have no observable impact on dependent receptors
Minor Beneficial	Some beneficial effect on attribute or reduced risk of negative effect occurring Water resources Reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk is <1% annually). Reduction of groundwater hazards to existing structures. Reduction in waterlogging and groundwater flooding.
Moderate Beneficial	Results in moderate improvement of attribute quality. Water resources Reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk is >1% annually). Contribution to improvement in water body WFD classification. Improvement in water body CAMS classification. Support to significant improvements in damaged GWDTE.
Major Beneficial	Results in major improvement of attribute quality. Water resources Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification.
No change	No loss or alteration of characteristics, features, or elements; no observable adverse or beneficial impacts.

4.4.2 At this stage, the design of the preferred pipeline corridor, temporary and permanent works is ongoing. As such, a detailed assessment of impacts to individual receptors is constrained. At this time, a qualitative assessment of the key risks to the receptors has been undertaken which are summarised in the construction impacts and operational impacts sections below. This assessment has considered both the significance of receptors that have the potential to be impacted, together with the likely magnitude of any impacts on those receptors (i.e. impacts that may result in significant effects). Potential mitigation measures of these key risks are highlighted in the Design Considerations and Recommendations section; however, these would need to be considered in relation to other environmental, design and operational constraints.

Construction impacts

4.4.3 Based on the baseline data collated to date, the following key construction activities are identified which have the potential to cause significant effects to receptors within the study area:

- Underground pipeline shafts are assumed to require dewatering to enable construction. This has the potential to locally reduce the groundwater table; potentially impacting any receptors within the radius of influence. When constructed in the Chalk, the risks of reducing the groundwater table could be significant due to the dependency of the receptors to the Chalk groundwater (e.g., Chalk streams, GWDTE etc).
- The construction of the tunnel within the Chalk has the potential to act as a barrier to flow; in particular if the tunnel cuts across a rapid flow pathway (such as a dissolution feature). Conversely the tunnel has the potential to act as a preferential pathway, enabling continuity between sources and receptors. The permanent impacts from the tunnel installation will be assessed within the construction impacts.
- Underground pipeline shafts constructed into the Chalk would provide a direct pathway for contamination from construction activities to the Principal Aquifer. Where the shafts are located within a SPZ1, this risk is increased due to the potential of impacting the local public water supply.
- Tunnelling within the Chalk also has the potential to impact the groundwater quality, as the underground pipeline would be in direct continuity with the Principal aquifer. Any loss (e.g., slurry) from the tunnel face could migrate to the public water supply (PWS) abstractions, whilst turbidity risks can be present from the creation of suspended sediments [60]. Groundwater quantity impacts could occur if groundwater is not fully excluded from the underground pipeline.
- Crossings of surface watercourses are a risk to both water quality and quantity. Quantity impacts could occur from a reduction in the groundwater table (from dewatering of the drive and reception shafts), which in turn could lead to a reduction in baseflow to the watercourse(s). Quality impacts are most likely from a polluting event (e.g. slurry breakout, spillage, uncontrolled surface run-off). This risk is increased when tunnelling through higher permeability deposits (Principal or Secondary A aquifers).
- On the basis that best practice construction and pollution prevention measures are employed, it is anticipated that water quality and quantity impacts from the open-cut sections of the underground pipeline would be generally limited. Exceptions to this may be where the preferred pipeline corridor is within close proximity to surface watercourses, groundwater-surface water interactions or licensed/unlicensed abstractions. Impacts to individual receptors proximal to the preferred pipeline corridor would need to be reviewed as the design is finalised, with the HIA informing micro-siting and routing works as the design develops.

Operational impacts

4.4.4 Based on the baseline data collated to date, the following key operational activities are identified which have the potential to cause significant effects to receptors within the study area:

- Accidental release of contaminants to groundwater during planned and unplanned activities.
- Leakage from/into the installed pipeline has the potential to alter the groundwater chemistry or lead to dissolution when within the Chalk.

Design considerations and recommendations

4.4.5 Based on the baseline data collected to date, the following underground pipeline routes are recommended from a hydrogeological impact perspective:

- A southern Itchen crossing is preferable as it is anticipated to be within London Clay, and not within the Chalk bedrock and SPZ1. By tunnelling through the lower permeability London Clay, the quality and quantity risks to the high value receptors in the area are significantly reduced:
  - The drawdown radius of influence from the launch and reception shafts would be significantly smaller and the required abstraction rates much lower, reducing net abstraction from the water environment and potential impacts to groundwater dependent features.
  - The risks to the water environment from a polluting incident are significantly less when constructing within unproductive/low permeability strata as the pathway to receptors is impeded.
- The southern proposed WRP to land west of London Road (A3) route (via the B2177) is preferable as it would reduce (and preferably remove) the requirement to tunnel through, and install shafts within, the SPZ1.
- The Meon crossing may be within the Principal Chalk aquifer if installed in the south-west of the corridor. Routing the underground pipeline north-east of Wickham Lodge out of the Chalk would reduce risks on the water environment (the bedrock is mapped as the Lambeth Group in the north-eastern half of the corridor).

4.4.6 Based on the potential significant impacts and risks highlighted previously, the following design considerations and recommendations for further works are summarised below:

- Early engagement with key stakeholders including the Water Companies, EA and Natural England.
- Groundwater excluding trenchless solutions should be used (such as closed face tunnelling methods or horizontal directional drilling).
- In addition to standard Risk Assessment and Method Statements (RAMS), a RAMS should be prepared specific to the tunnelling operations within SPZ1 and agreed with key stakeholders (EA and abstraction operators) at an early stage of the design. The RAMS should include a detailed description on the tunnelling selection and methodology, evidence of past successful utilisation

within karstic Chalk and SPZ1, identification of key risks to the aquifer (e.g., slurry loss, turbidity etc) and control measures to reduce risks.

- Underground pipeline shafts within the Chalk should be avoided, where possible. No shafts should be installed within the Chalk in an SPZ1, without due consideration of the risks and only when absolutely necessary. Any shafts within SPZ1 would need to be discussed in detail with the abstraction operator and the EA.
- Trenchless river crossings within the Chalk should be avoided where possible, particularly at the Itchen and Meon crossings.
- The tunnelling methodology and underground pipeline design are to consider the integrity of the underground pipeline should large karstic/dissolution features within the Chalk bedrock be encountered.
- The permanent works design should consider leakage risk during operation (contamination and dissolution risks).
- Site investigation should be undertaken at key locations along the preferred pipeline corridor, with a focus on trenchless sections and in proximity to high value receptors. Site investigation should include permeability testing at locations where groundwater control operations are likely in the future (e.g., shafts). Pumping tests are beneficial to ascertain hydrogeological parameters but may be best undertaken by the main works contractor once the detailed design is finalised so particular horizons/areas can be investigated.
- Site investigations within the SPZ1 would need specific consideration, with a method statement agreed with key stakeholders including the EA and the relevant water company. Specific measures may include a secure well head, limitations on drilling fluids/enhancers and an appropriate drilling technique and flush.
- Groundwater samples within the Chalk should include testing for contaminants that can be indicative of a rapid flow component (i.e., dissolution features) with connectivity to the surface. This can include determinants such as turbidity, coliforms and pesticides that degrade rapidly in the subsurface.
- Site visits to ground truth key receptors identified within the HIA are recommended following receipt of initial site investigation data and as the design is progressed.
- Development of a water monitoring strategy to ascertain the hydrological baseline, identify variations (both natural or anthropogenic) and inform mitigation measures is recommended. This strategy would be agreed with key stakeholders and could be an appendix to the Water environment (including flood risk) chapter of the PEI Report and ES. The strategy should include long term groundwater monitoring in key areas (from installation to post-construction) to ascertain seasonal variability in groundwater levels and monitor groundwater fluctuations pre, during and post construction.
- Quantitative assessment of dewatering impacts (drawdowns and flows) from shafts constructed in Principal and Secondary Aquifers, is undertaken and included in future revisions of the HIA.
- Assessment of potential barrier to flow risk is undertaken and included in future revision of the HIA.

- A voids treatment protocol is developed, to document how voids encountered during construction within the Chalk would be mitigated.
- Best practice (or better) water management and pollution prevention measures to be utilised as per relevant EA and CIRIA guidance and documented within the Construction Environmental Management Plan.

5 Mitigation measures and residual impacts

5.1 Introduction

5.1.1 This section is to be updated and finalised following receipt of additional site specific information, progression of the design and further engagement with stakeholders.

5.2 Embedded mitigation measures

5.2.1 Avoidance and prevention of water impacts will be embedded into the design of the Proposed Development (primary mitigation), where possible in accordance with the hierarchy of mitigation as described in Chapter 5 General EIA approach and methodology within Volume I. The assessment of impacts and likely significant effects will be made with these primary mitigation measures in place.

5.3 Significance of effect taking into consideration embedded mitigation

5.3.1 Following further development of the design, assessment of the significance of effect would be undertaken, by taking into consideration the magnitude of impact and value of the receptor.

5.3.2 The significance of effect upon the receptor is assessed using the matrix in Table 5-1 below (based on Table 3.8.1. of DMRB LA 104).

Table 5-1: Significance matrix

		Magnitude of Impact (Degree of Change)				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Environmental Value (Sensitivity)	High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	Medium	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Low	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Very Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

5.3.3 Where the assessment indicates the significance (taking into consideration embedded mitigation) would be moderate or above this would be summarised below.

5.4 Additional mitigation measures

5.4.1 Additional mitigation measures to reduce the impact to receptors would be highlighted here. Additional mitigation measures are to be confirmed as the design is progressed.

5.4.2 The findings of future iterations of the HIA would feed into management plans to be produced, with iterations as detail design develops, and would be secured and delivered through the DCO.

5.4.3 The management plans would ensure that environmental impacts identified in environmental studies and assessments would be properly managed and that controls would be put in place to reduce the impacts of the Proposed Development on the natural and human environment during construction.

5.5 Residual impacts

5.5.1 Residual impacts from the temporary (construction) and permanent (operational) works would be summarised here.

6 Conclusions and recommendations

6.1.1 The HIA is a work in progress and has been developed to date to document the conceptual understanding of the hydrogeology based on publicly available records and inform further works and design.

6.1.2 From initial review of the baseline data, key construction activities and risks have been identified which may lead to significant impacts:

- Tunnelling and shaft construction within the Chalk; particularly within SPZ1 areas. The key risks that need further consideration are the contamination risks due to direct continuity with the Principal Aquifer and the quantity/flow impacts from dewatering and installation of the permanent infrastructure.
- Trenchless crossings of surface water features. The key risks that need further considerations are the pollution risks and the quantity/baseflow impacts from dewatering.
- Leakage from the pipeline in the permanent state. The key risks being alteration of groundwater chemistry and dissolution.

6.1.3 Based on the assessment of key risks, the report recommends the following underground pipeline routes from a hydrogeological perspective:

- A southern Itchen crossing
- The southern proposed WRP to land west of London Road (A3) route (via the B2177)
- The Meon crossing is located north-east of Wickham Lodge

6.1.4 In addition, the report highlights the following design considerations and recommendations for further works:

- Early engagement with key stakeholders including the Water Companies, EA and Natural England.
- When trenchless methodologies or tunnelling is to be utilised, groundwater excluding methodologies should be selected (such as closed face solutions or horizontal directional drilling).
- A RAMS should be prepared specific to the tunnelling operations within SPZ1 and agreed with key stakeholders (EA and abstraction operators) at an early stage of the design. The RAMS should include a detailed description on the tunnelling selection and methodology, evidence of past successful utilisation within karstic Chalk and SPZ1, identification of key risks to the aquifer (e.g., slurry loss, turbidity etc) and control measures to reduce risks.
- Underground pipeline shafts within the Chalk should be avoided, where possible. No shafts should be installed within the Chalk in an SPZ1, without due consideration of the risks and only when absolutely necessary. Any shafts within SPZ1 would need to be discussed in detail with the abstraction operator and the EA.
- Trenchless crossings within the Chalk should be avoided where possible, particularly at the Itchen and Meon crossings.

- The tunnelling methodology and underground pipeline design are to consider the integrity of the underground pipeline should large karstic/dissolution features within the Chalk bedrock be encountered.
- The permanent works design should consider leakage risk during operation (contamination and dissolution risks).
- Site investigation should be undertaken at key locations along the Proposed Underground Pipeline route, with a focus on trenchless sections and in proximity to high value receptors. Site investigation should include permeability testing at locations where groundwater control operations are likely in the future (e.g., shafts). Pumping tests are beneficial to ascertain hydrogeological parameters but may be best undertaken by the main works contractor once the detailed design is finalised so particular horizons/areas can be investigated.
- Site investigations within the SPZ1 would need specific consideration, with a method statement agreed with key stakeholders including the EA and the relevant water company. Specific measures may include a secure well head, limitations on drilling fluids/enhancers and an appropriate drilling technique and flush.
- Groundwater samples within the Chalk should include testing for contaminants that can be indicative of a rapid flow component (i.e., dissolution features) with connectivity to the surface. This can include determinants such as turbidity, coliforms and pesticides that degrade rapidly in the subsurface.
- Site visits to ground truth key receptors identified within the HIA is recommended following receipt of initial site investigation data and as the design is progressed.
- Development of a water monitoring strategy to ascertain the hydrological baseline, identify variations (both natural or anthropogenic) and inform mitigation measures is recommended. This strategy would be agreed with key stakeholders. The strategy should include long term groundwater monitoring in key areas (from installation to post-construction) to ascertain seasonal variability in groundwater levels and monitor groundwater fluctuations pre, during and post construction.
- Quantitative assessment of dewatering impacts (drawdowns and flows) from shafts constructed in Principal and Secondary Aquifers, is undertaken and included in future revisions of the HIA.
- Assessment of potential barrier to flow risk is undertaken and included in future revision of the HIA.
- A voids treatment protocol is developed, to document how voids encountered during construction within the Chalk would be mitigated.
- Best practice (or better) water management and pollution prevention measures to be utilised as per relevant EA and CIRIA guidance and documented within the Construction Environmental Management Plan.

6.1.5 The HIA would be updated for the PEI Report (and subsequently the ES), taking into consideration local data received from stakeholders and the initial site investigation works which would be key to refining the conceptual understanding. A more detailed assessment of impacts to receptors can then be undertaken to ascertain if there are any significant effects which require additional mitigation

measures. Receptors not in hydraulic continuity with the scheme can also be scoped out of further assessment.

6.1.6 As further design and stakeholder engagement progresses, opportunities for beneficial impacts and betterment would also be documented.

Annex A - Conceptual model cross sections

Figures A1 to A10

Figure A1: General overview of cross sections

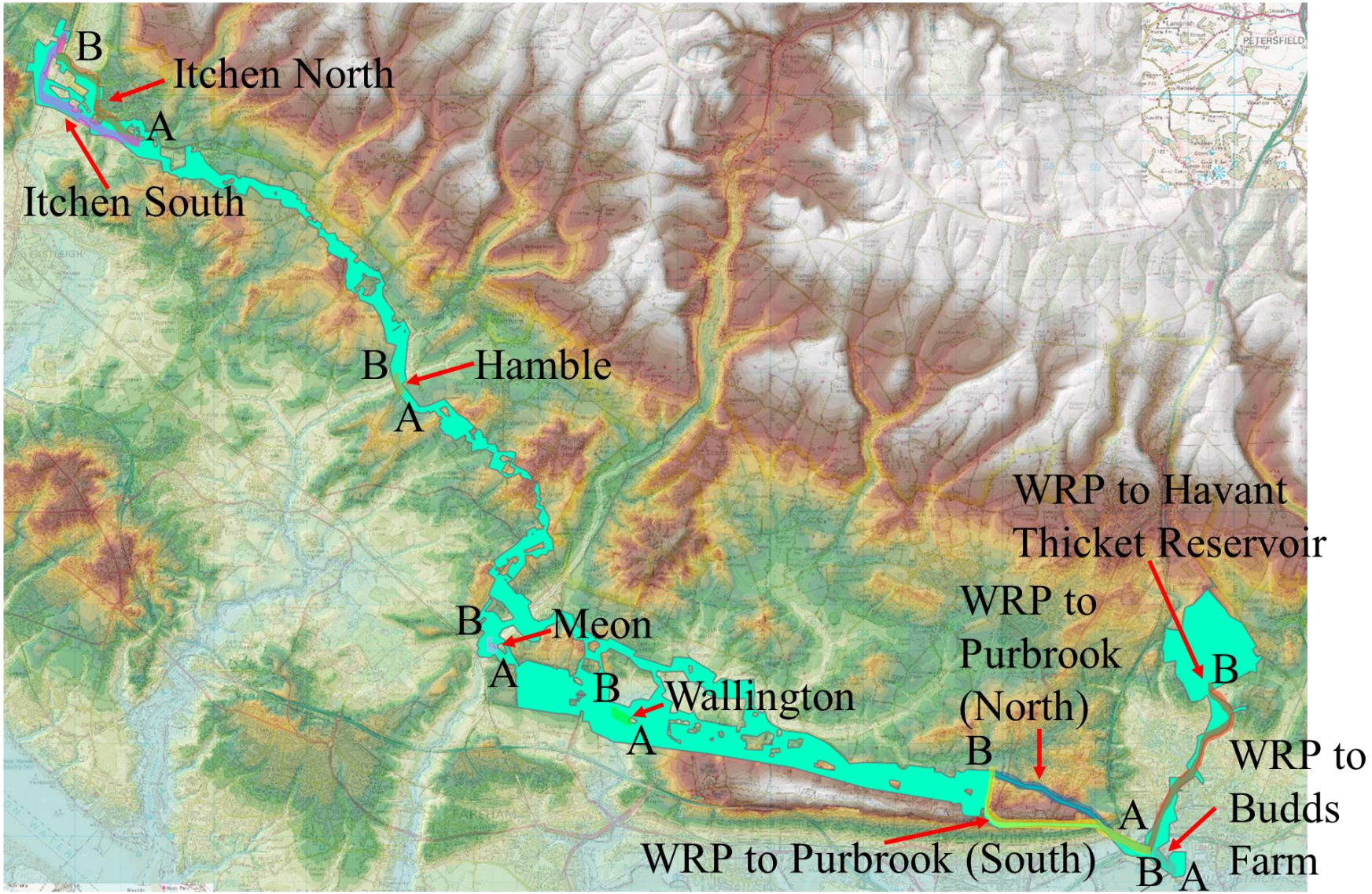


Figure A2: River Itchen North Crossing

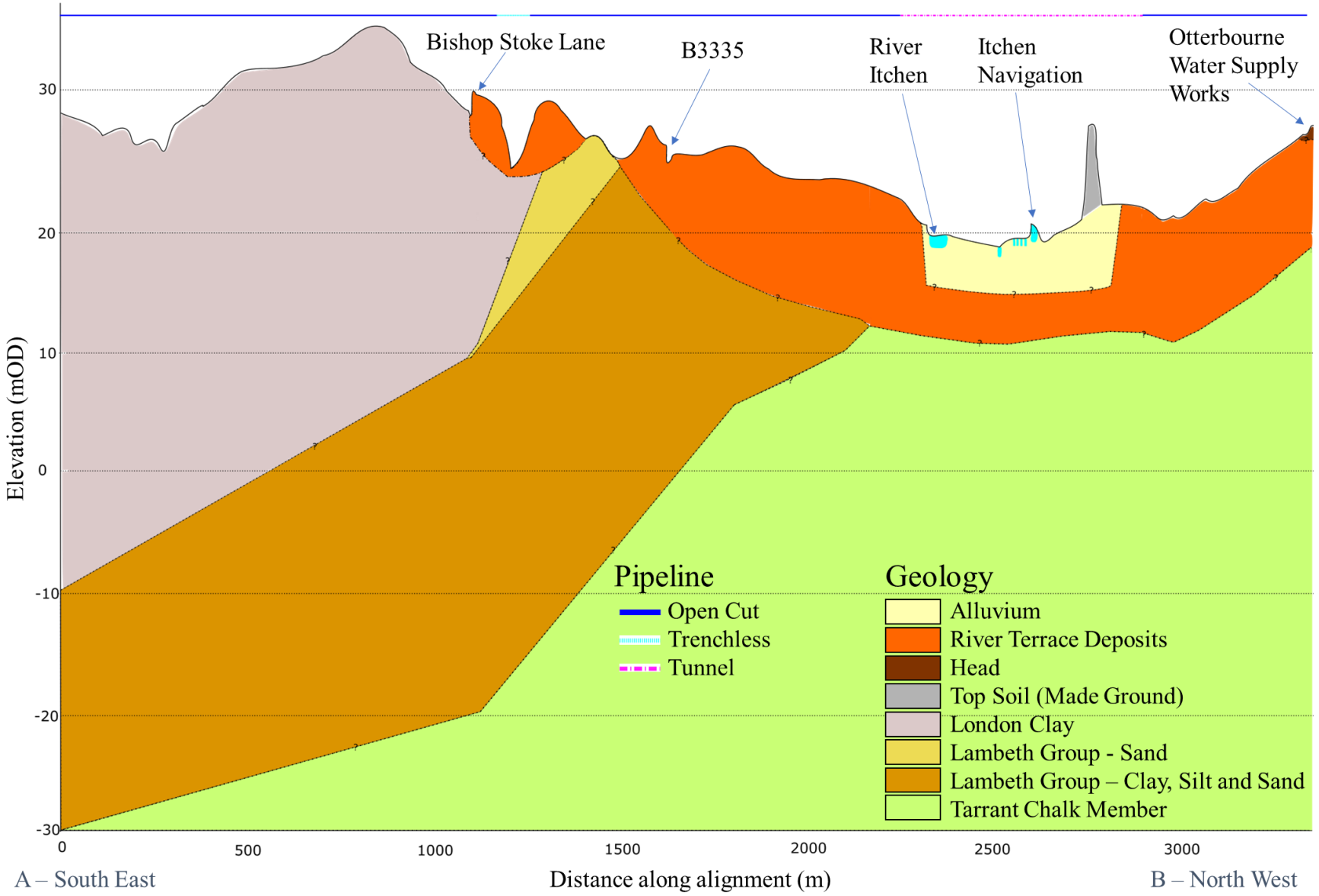


Figure A3: River Itchen South Crossing

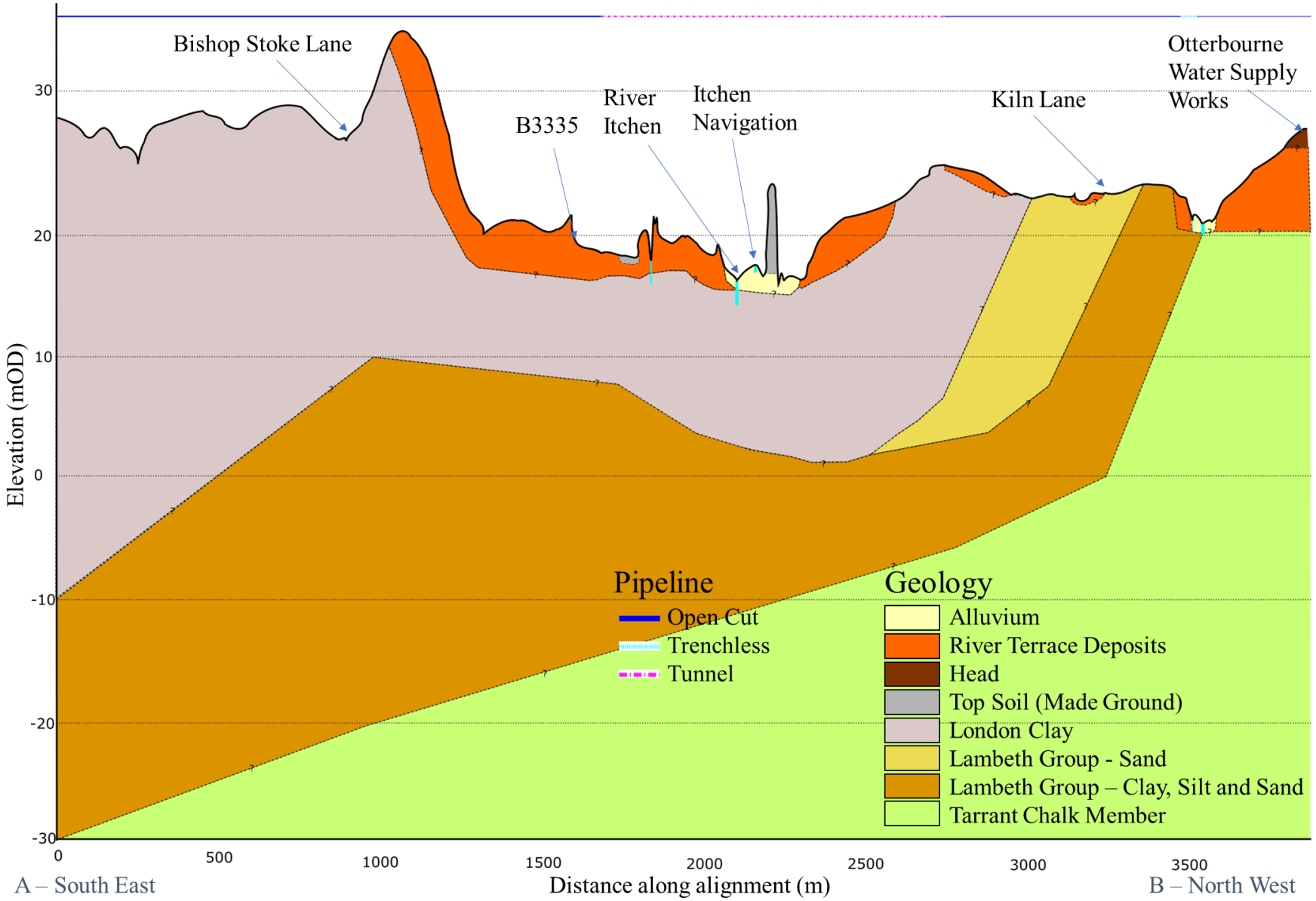


Figure A4: River Meon Crossing

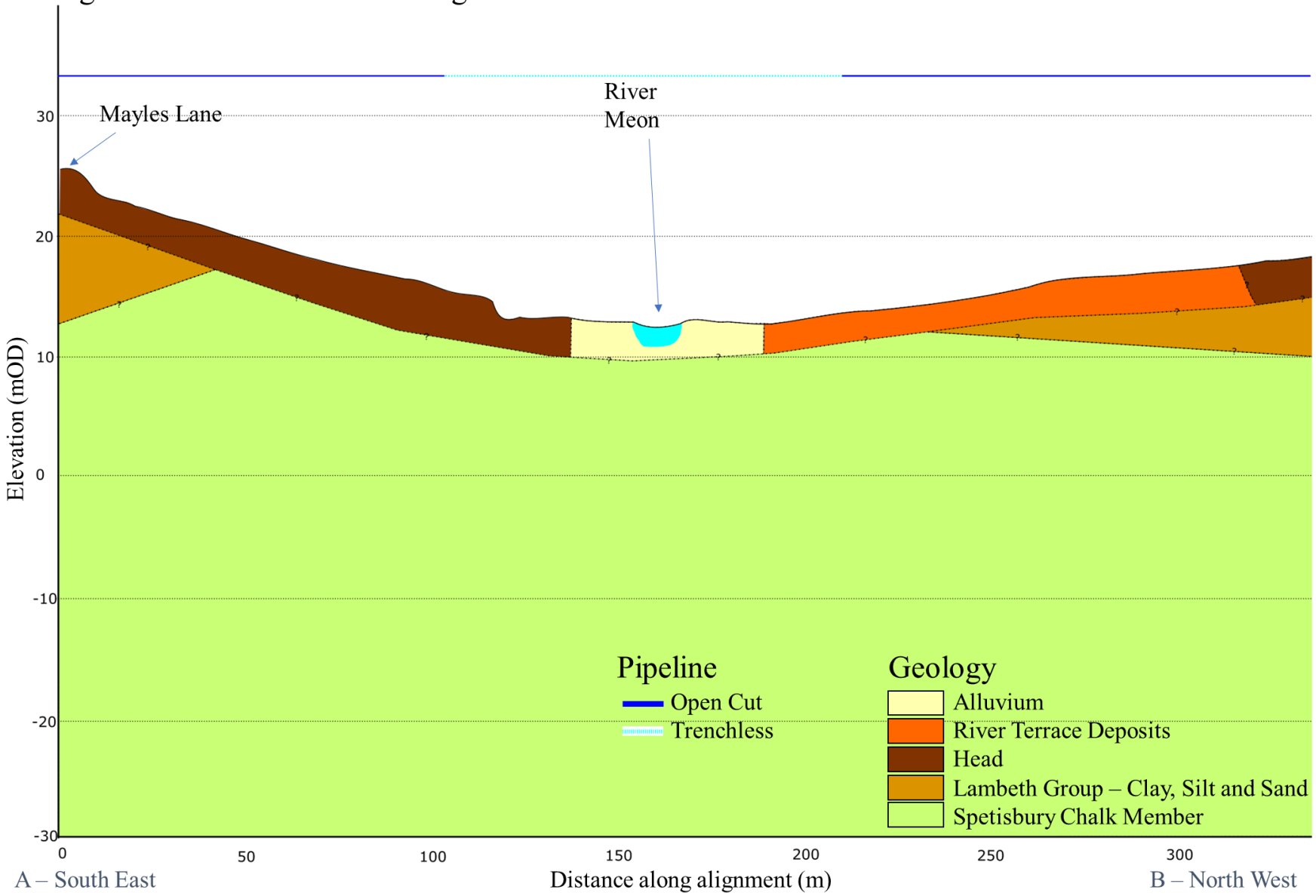


Figure A5: River Hamble Crossing

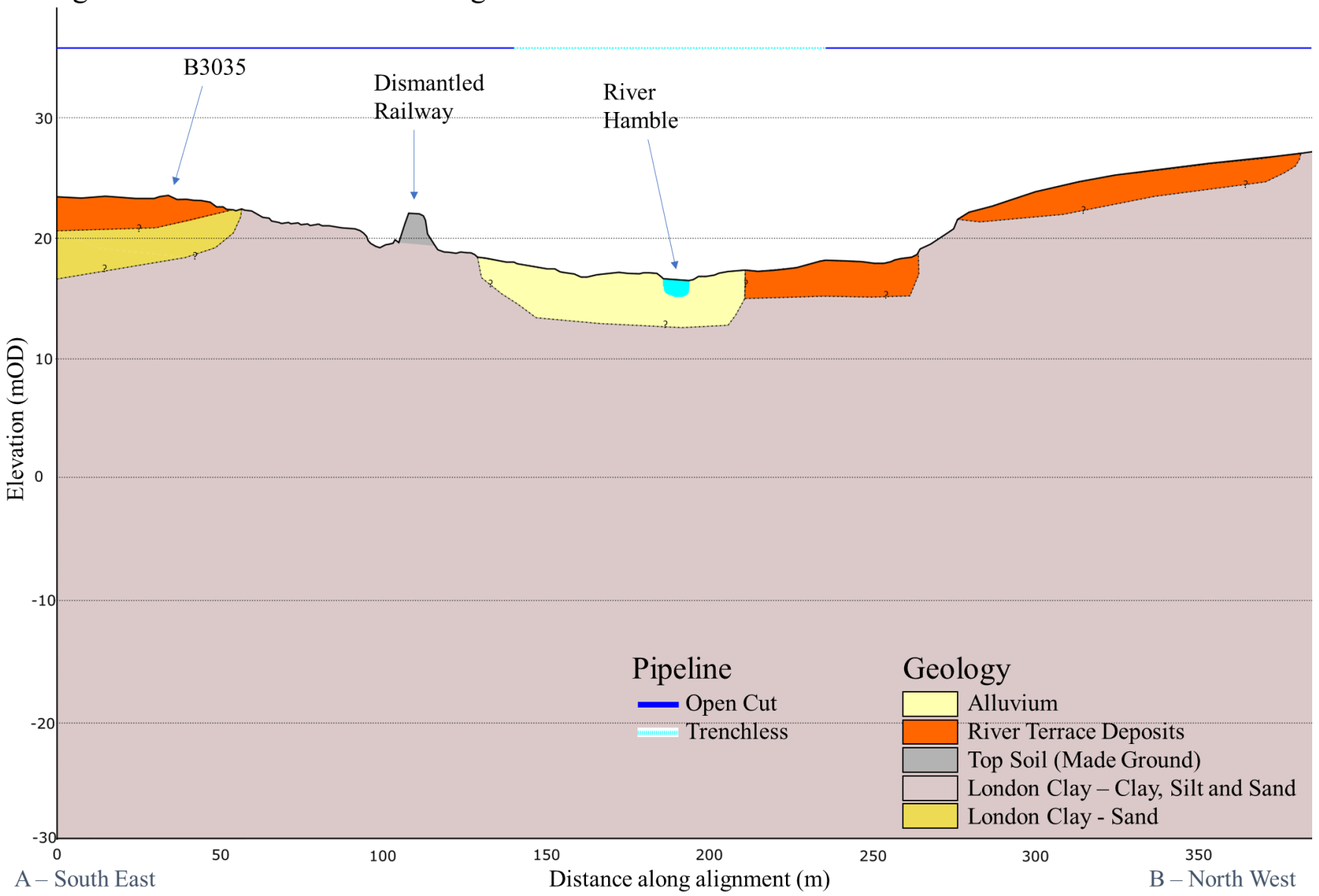


Figure A6: River Wallington Crossing

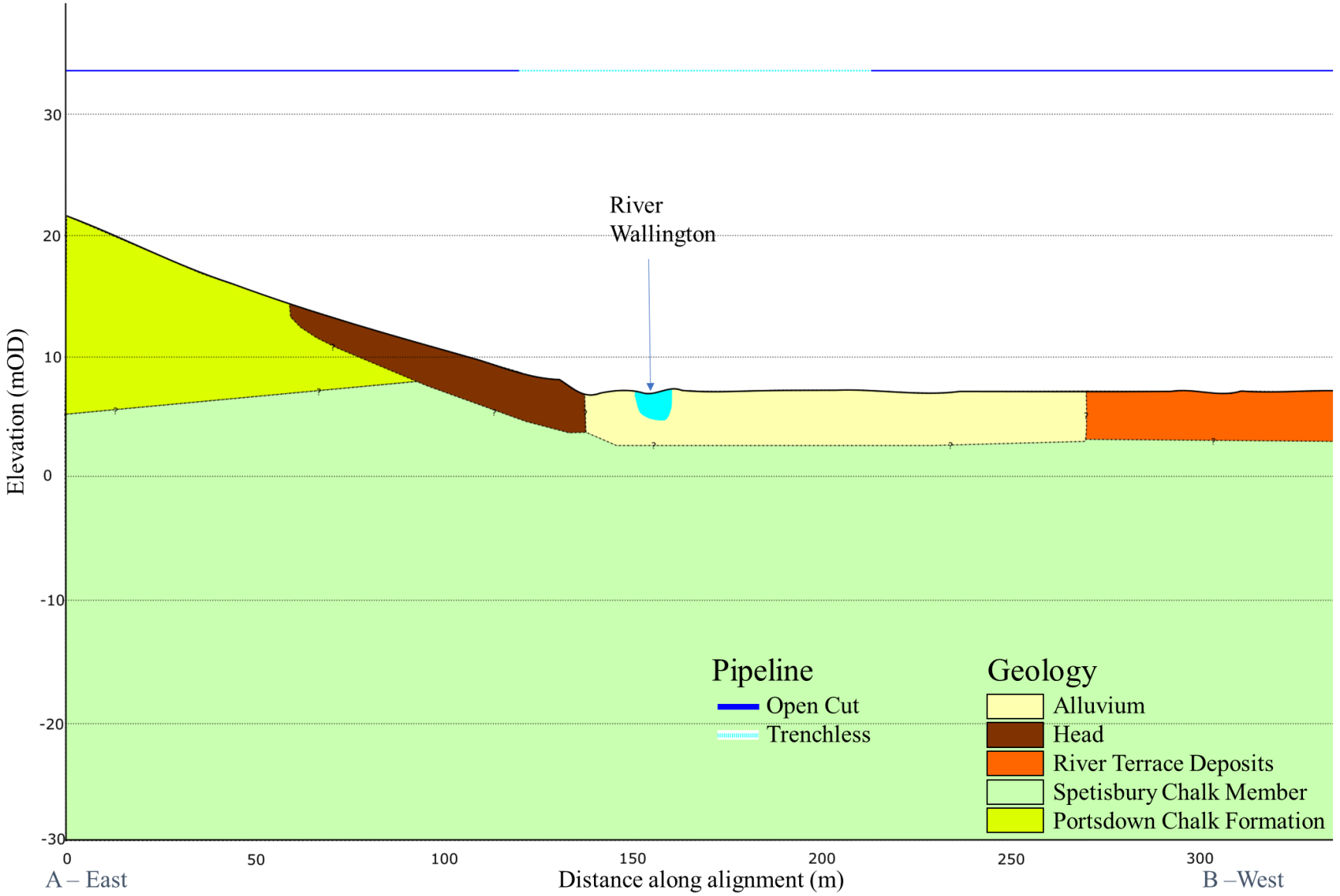


Figure A7: WRP to Havant Thicket Reservoir

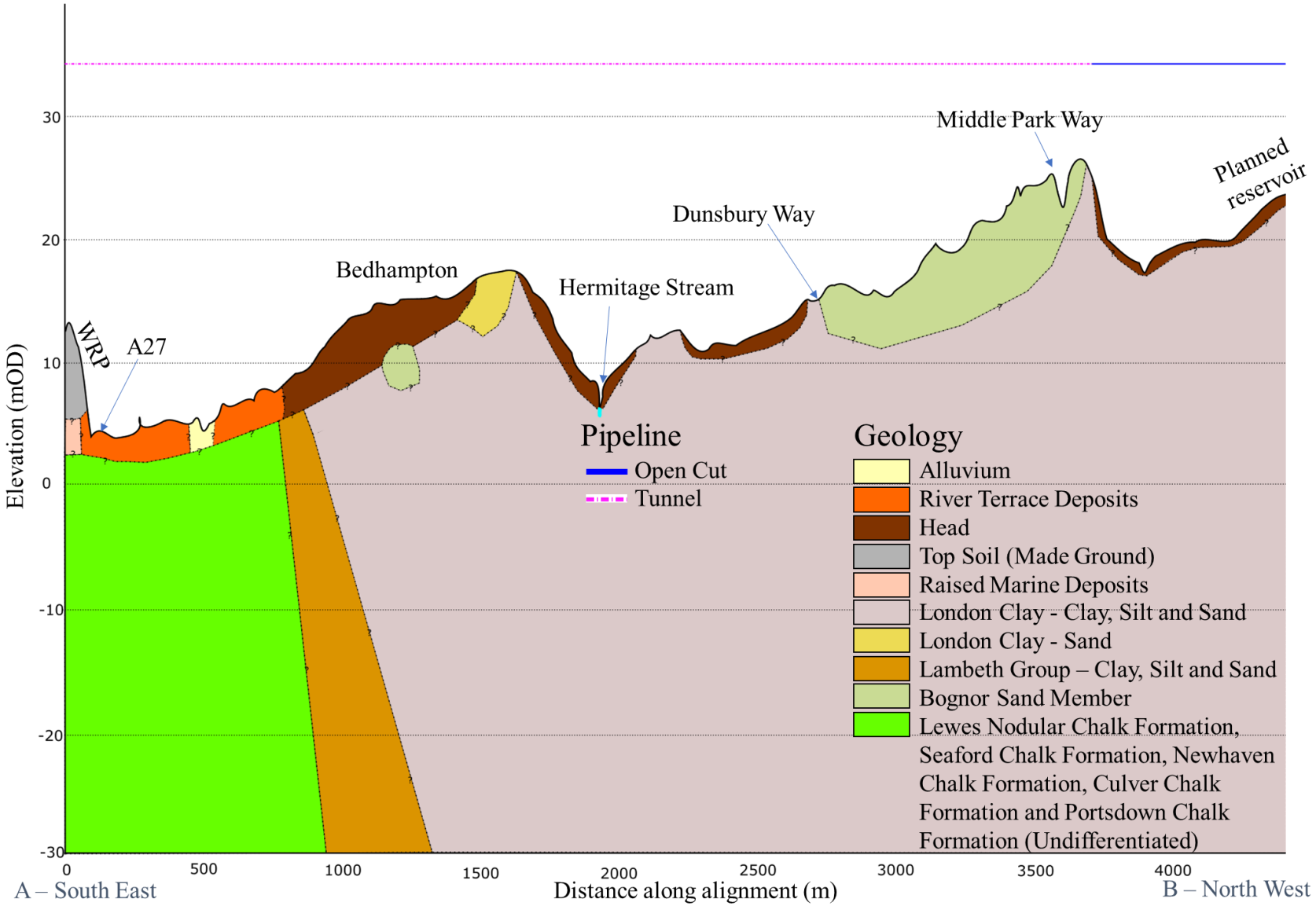


Figure A8: WRP to Budds Farm WTW

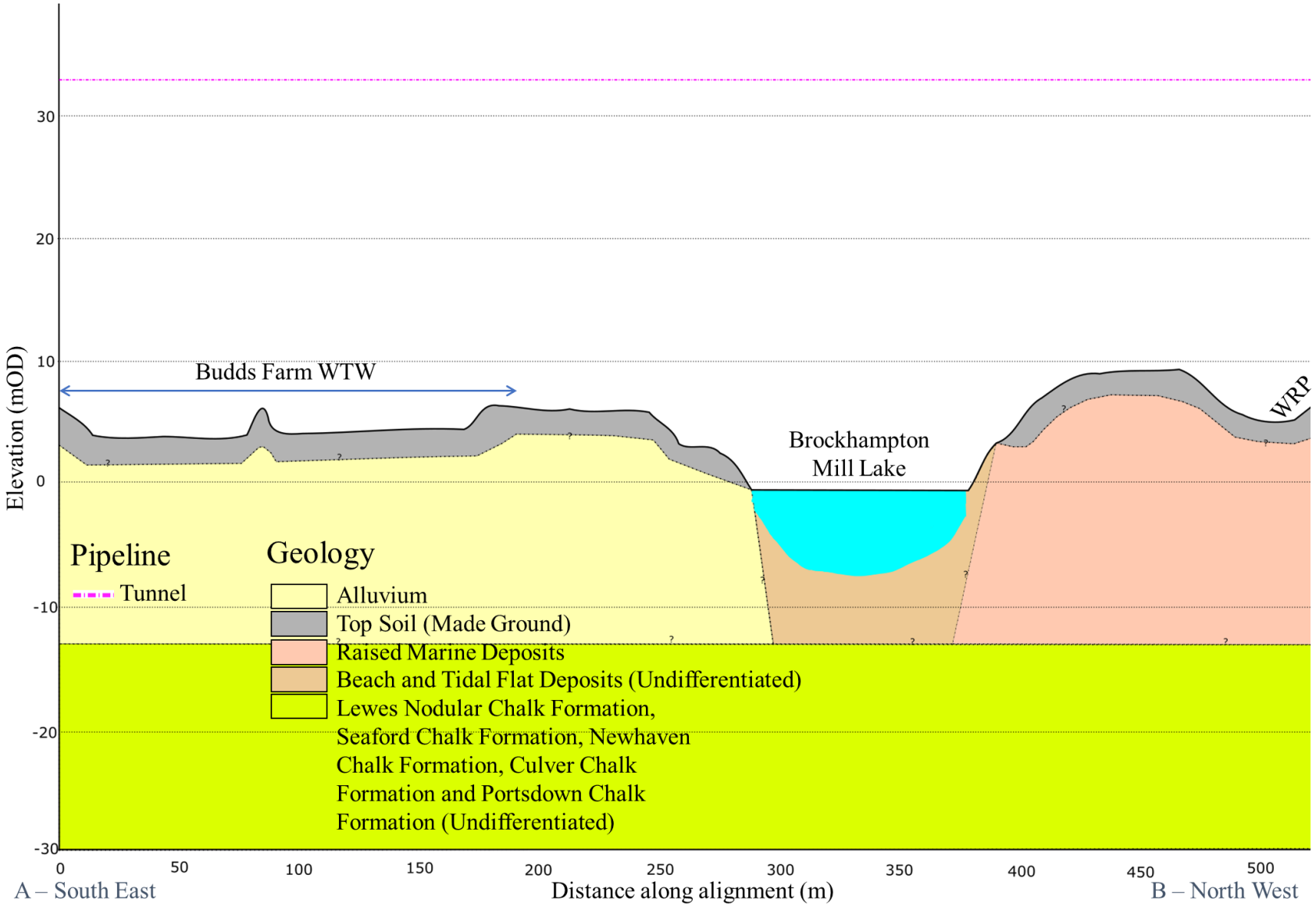


Figure A9: WRP to Purbrook (South)

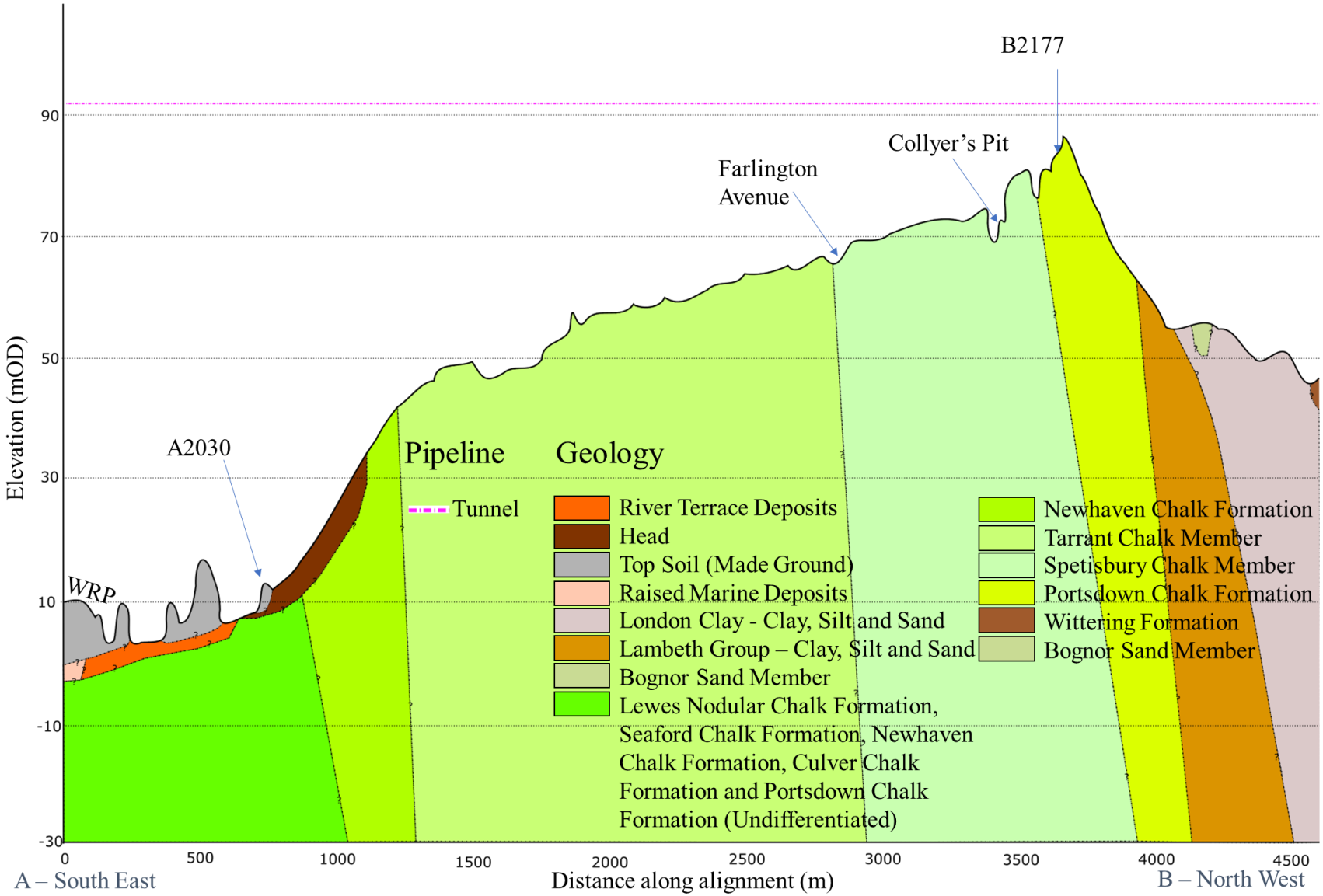
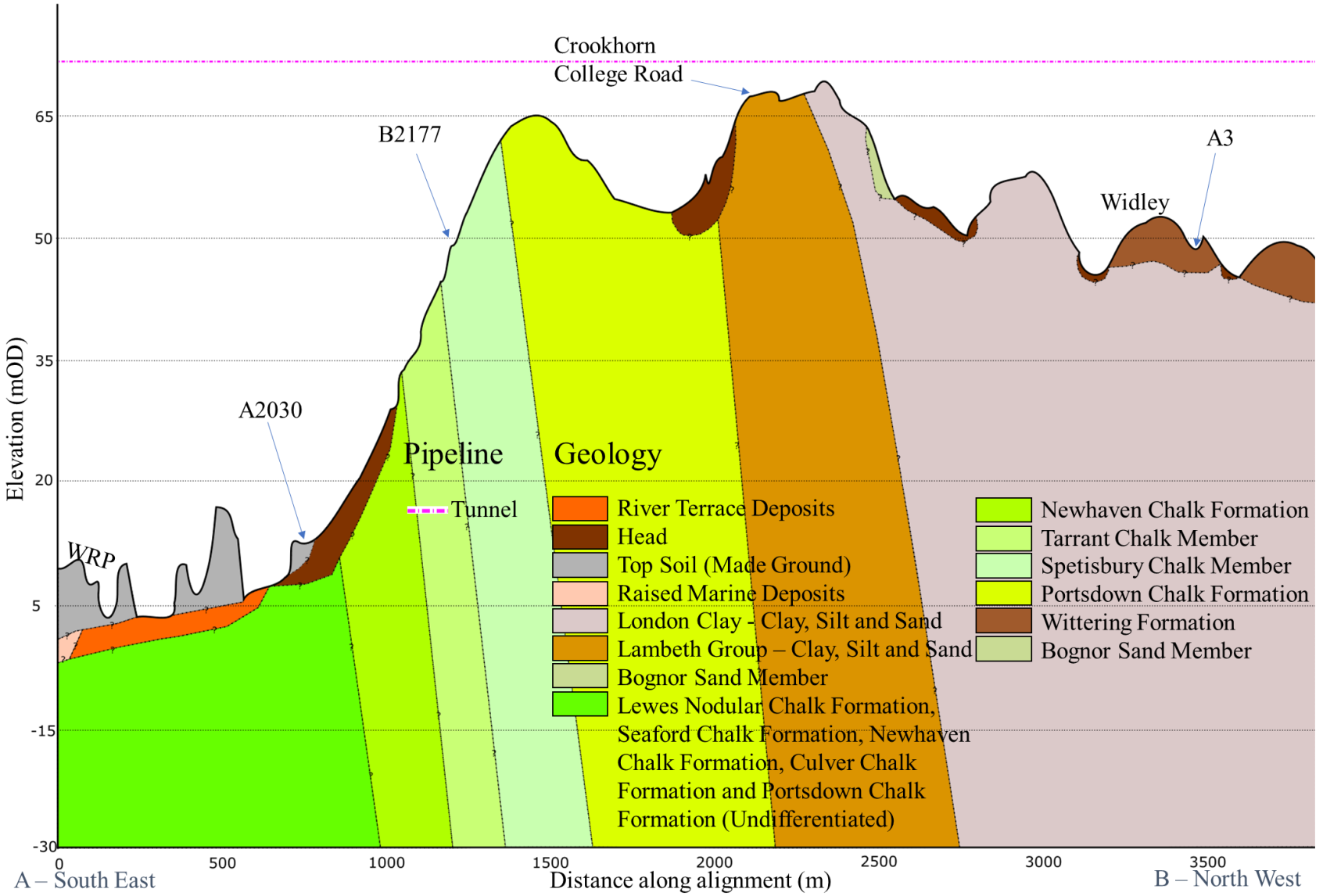


Figure A10: WRP to Purbrook (North)



Appendix 18.2 Water Body water dependent protected areas

1 Water Body water dependent protected areas

1.1 River water bodies

Water body/protected area	ID	Type
Hermitage Stream (GB107042016370)		
Chichester, Langstone and Portsmouth Harbours Eutrophic Nitrate Vulnerable Zone (NVZ) transitional and coastal (TraC)	ET2	NVZ
Langstone Harbour	UKSW33	Shellfish Water Directive
Lavant (Hants) (GB107042016420)		
Hampshire Chalk	G143	Nitrates Directive
Chichester, Langstone and Portsmouth Harbours Eutrophic NVZ (TraC)	ET2	Nitrates Directive
Langstone Harbour	UKSW33	Shellfish Water Directive
Potwell Tributary (GB107042016400)		
Chichester, Langstone and Portsmouth Harbours Eutrophic NVZ (TraC) ET2	ET2	NVZ
Wallington below Southwick (GB107042016360)		
Fareham G58	G58	NVZ
Chichester, Langstone and Portsmouth Harbours Eutrophic NVZ (TraC) ET2	ET2	NVZ
Portsmouth Harbour	UKSW34	Shellfish Water Directive
Meon (GB107042016640)		
Hampshire Chalk G143	G143	NVZ
Solent & Southampton Water	UK9011061	SPA
R. Meon NVZ S527	S527	NVZ
Approaches to Southampton Water	UKSW36	Shellfish Water Directive
Central Solent	UKSW46	Shellfish Water Directive
Main River Hamble (GB107042016250)		
Hamble Estuary Eutrophic NVZ (TraC) ET3	ET3	NVZ
Approaches to Southampton Water	UKSW36	Shellfish Water Directive
River Hamble	UKENRI122	Urban Waste Water Treatment
Upper Hamble (GB107042016250)		
Hamble Estuary Eutrophic NVZ (TraC) ET3	ET3	NVZ

Water body/protected area	ID	Type
Hampshire Chalk G143	G143	NVZ
Upper Hamble NVZ S810	S810	NVZ
Moors Stream (GB107042016260)		
Hamble Estuary Eutrophic NVZ (TraC) ET3	ET3	NVZ
Hampshire Chalk G143	G143	NVZ
Horton Heath Stream (GB107042016270)		
Hamble Estuary Eutrophic NVZ (TraC) ET3	ET3	NVZ
Bow Lake (GB107042016650)		
Hamble Estuary Eutrophic NVZ (TraC) ET3	ET3	NVZ
Bow Lake NVZ S811	S811	NVZ
Itchen (GB107042022580)		
Hamble Estuary Eutrophic NVZ (TraC) ET3	ET3	NVZ
Hampshire Chalk G143	G143	NVZ
Itchen	UKGB107042022580	Drinking Water Protected Area
River Itchen (Hampshire)	UKENRI110	Urban Waste Water Treatment
River Itchen	UK0012599	SAC
Southampton Water	UKSW35	Shellfish Water Directive

1.2 Canal water bodies

Water body protected area	ID	Type
Itchen Navigation (GB70710008)		
Hamble Estuary Eutrophic NVZ (TraC) ET3	ET3	NVZ
Hampshire Chalk G143	G143	NVZ

1.3 Transitional water bodies

Water body protected area	ID	Type
Langstone Harbour (GB580705130000)		
Chichester, Langstone and Portsmouth Harbours Eutrophic NVZ (TraC)	ET2	Nitrates Directive
Chichester And Langstone Harbours	UK9011011	SPA
Solent Maritime	UK0030059	SAC
Chichester And Langstone Harbours	UK11013	Ramsar Site
Solent And Dorset Coast	UK9020330	SPA
Langstone Harbour	UKSW33	Shellfish Water Directive
Chichester Harbour (Emsworth Channel)	UKSW30	Shellfish Water Directive

Water body protected area	ID	Type
Portsmouth Harbour	UKENCA111	Urban Waste Water Treatment Directive
Portsmouth Harbour	UKSW34	Shellfish Water Directive
Langstone Harbour	UKENCA55	Urban Waste Water Treatment Directive
Portsmouth Harbour GB580705140000		
Chichester,Langstone and Portsmouth Harbours Eutrophic NVZ (TraC)	ET2	Nitrates Directive
Solent And Dorset Coast	UK9020330	SPA
Portsmouth Harbour	UKENCA111	Urban Waste Water Treatment Directive
Portsmouth Harbour	UK11055	Ramsar Site
Portsmouth Harbour	UK9011051	SPA
Spithead and Stokes Bay	UKSW48	Shellfish Water Directive
Portsmouth Harbour	UKSW34	Shellfish Water Directive
Chichester Harbour (GB580705210000)		
Chichester Harbour	UKENCA56	Urban Waste Water Treatment Directive
Chichester,Langstone and Portsmouth Harbours Eutrophic NVZ (TraC)	ET2	Nitrates Directive
Chichester And Langstone Harbours	UK9011011	SPA
Solent Maritime	UK0030059	SAC
Chichester And Langstone Harbours	UK11013	Ramsar Site
Chichester Harbour (Thornham Channel)	UKSW31	Shellfish Water Directive
Langstone Harbour	UKSW33	Shellfish Water Directive
Chichester Harbour (Emsworth Channel)	UKSW30	Shellfish Water Directive
Chichester Harbour (Chichester Channel)	UKSW32	Shellfish Water Directive
Southampton Water		
Hamble Estuary Eutrophic NVZ (TraC)	ET3	Nitrates Directive
Solent Maritime	UK0030059	SAC
Approaches to Southampton Water	UKSW36	Shellfish Water Directive
Solent And Dorset Coast	UK9020330	SPA
Solent & Southampton Water	UK9011061	SPA
Solent & Southampton Water	UK11063	Ramsar Site
Stanswood Bay	UKSW37	Shellfish Water Directive
River Itchen (Hampshire)	UKENRI110	Urban Waste Water Treatment Directive
River Itchen	UK0012599	SAC
Southampton Water	UKSW35	Shellfish Water Directive
River Hamble	UKENRI122	Urban Waste Water Treatment Directive

Water body protected area	ID	Type
Hamble Estuary	UKENCA123	Urban Waste Water Treatment Directive

1.4 Coastal water bodies

Water body protected area	ID	Type
Solent (GB650705150000)		
Hamble Estuary Eutrophic NVZ (TraC)	ET3	Nitrates Directive
Chichester Harbour	UKENCA56	Urban Waste Water Treatment Directive
Cowes and Medina_M	UKSW45	Shellfish Water Directive
Eastney	UK16500	Bathing Water Directive
Lymington and Sowley_M	UKSW40	Shellfish Water Directive
Chichester,Langstone and Portsmouth Harbours Eutrophic NVZ (TraC)	ET2	Nitrates Directive
Chichester And Langstone Harbours	UK9011011	SPA
Solent Maritime	UK0030059	SAC
Chichester And Langstone Harbours	UK11013	Ramsar Site
Approaches to Southampton Water	UKSW36	Shellfish Water Directive
Solent And Dorset Coast	UK9020330	SPA
South Wight Maritime	UK0030061	SAC
Solent & Southampton Water	UK9011061	SPA
Solent & Southampton Water	UK11063	Ramsar Site
Solent & Isle Of Wight Lagoons	UK0017073	SAC
Pennington	UKSW41	Shellfish Water Directive
Langstone Harbour	UKSW33	Shellfish Water Directive
Ryde	UK17900	Bathing Water Directive
Yarmouth	UKSW42	Shellfish Water Directive
Newtown harbour, Mediina Estuary and Eastern Yar Eutrophic NVZ (TraC)	ET7	Nitrates Directive
Stokes Bay	UK16700	Bathing Water Directive
Lepe Middle Bank	UKSW38	Shellfish Water Directive
Central Solent	UKSW46	Shellfish Water Directive
East Cowes	UK17850	Bathing Water Directive
Stanswood Bay	UKSW37	Shellfish Water Directive
Calshot	UK16900	Bathing Water Directive
Medina Estuary	UKENCA121	Urban Waste Water Treatment Directive
Newtown_M	UKSW43	Shellfish Water Directive
Newtown Harbour	UKENCA124	Urban Waste Water Treatment Directive

Water body protected area	ID	Type
Colwell Bay	UK17600	Bathing Water Directive
Ryde	UKSW47	Shellfish Water Directive
Beachlands West	UK16400	Bathing Water Directive
Eastoke	UK16300	Bathing Water Directive
Lepe	UK17000	Bathing Water Directive
Lee-on-Solent	UK16800	Bathing Water Directive
Seagrove	UK18000	Bathing Water Directive
Hillhead	UK16850	Bathing Water Directive
Beachlands Central	UK16350	Bathing Water Directive
Spithead and Stokes Bay	UKSW48	Shellfish Water Directive
Cowes	UK17800	Bathing Water Directive
Totland Bay	UK17500	Bathing Water Directive
Gurnard	UK17700	Bathing Water Directive
Southsea East	UK16600	Bathing Water Directive
Isle of Wight (GB650705530000)		
Sandown	UK18400	Bathing Water Directive
Chichester Harbour	UKENCA56	Urban Waste Water Treatment Directive
Chichester,Langstone and Portsmouth Harbours Eutrophic NVZ (TraC)	ET2	Nitrates Directive
Chichester And Langstone Harbours	UK9011011	SPA
Solent Maritime	UK0030059	SAC
Chichester And Langstone Harbours	UK11013	Ramsar Site
Solent And Dorset Coast	UK9020330	SPA
South Wight Maritime	UK0030061	SAC
Solent & Southampton Water	UK9011061	SPA
Solent & Southampton Water	UK11063	Ramsar Site
Chichester Harbour (Emsworth Channel)	UKSW30	Shellfish Water Directive
Newtown harbour, Mediina Estuary and Eastern Yar Eutrophic NVZ (TraC)	ET7	Nitrates Directive
Bracklesham Bay	UK16000	Bathing Water Directive
Ventnor	UK18600	Bathing Water Directive
Yaverland	UK18350	Bathing Water Directive
Whitecliff Bay	UK18300	Bathing Water Directive
Shanklin	UK18500	Bathing Water Directive
West Wittering	UK16100	Bathing Water Directive
Bembridge	UK18200	Bathing Water Directive

1.5 Groundwater Bodies

Water body protected area	ID	Type
East Hants Chalk (GB40701G502700)		
Hamble Estuary Eutrophic NVZ (TraC)	ET3	Nitrates Directive
Hampshire Chalk	G143	Nitrates Directive
Fareham	G58	Nitrates Directive
Chichester,Langstone and Portsmouth Harbours Eutrophic NVZ (TraC)	ET2	Nitrates Directive
Sussex Chalk	G56	Nitrates Directive
Chichester And Langstone Harbours	UK9011011	SPA
Solent Maritime	UK0030059	SAC
R. Meon NVZ	S527	Nitrates Directive
Chichester And Langstone Harbours	UK11013	Ramsar Site
Upper Hamble NVZ	S810	Nitrates Directive
Solent And Dorset Coast	UK9020330	SPA
Solent & Isle Of Wight Lagoons	UK0017073	SAC
Bow Lake NVZ	S811	Nitrates Directive
WARBLINGTON STREAM - NO.2 NVZ	S667	Nitrates Directive
Fareham	GWSGZ0145	Safeguard Zone
Portsmouth Harbour	UK11055	Ramsar Site
North Warnford	GWSGZ0308	Safeguard Zone
Portsmouth Harbour	UK9011051	SPA
Bishops Waltham	GWSGZ0309	Safeguard Zone
Clanfield	GWSGZ0138	Safeguard Zone
Catherington South	GWSGZ0144	Safeguard Zone
East Hants Chalk	UKGB40701G502700	Drinking Water Protected Area
South East Hants Bracklesham Group (GB40702G503000)		
Hamble Estuary Eutrophic NVZ (TraC) ET3	ET3	NVZ
Chichester, Langstone and Portsmouth Harbours Eutrophic NVZ (TraC) ET2	ET2	NVZ
Broad Rife NVZ S516	S516	NVZ
South East Hants Bracklesham Group	UKGB40702G503000	Drinking Water Protected Area
Broad Rifer to Chichester Harbour NVZ S666	S666	NVZ
East Hants Lambeth Group (GB40702G500800)		
Hamble Estuary Eutrophic NVZ (TraC) ET3	ET3	NVZ
Hampshire Chalk G143	G143	NVZ
Chichester, Langstone and Portsmouth Harbours Eutrophic NVZ (TraC) ET2	ET2	NVZ

Water body protected area	ID	Type
Sussex Chalk G56	G56	NVZ
R. Meon NVZ S527	S527	NVZ
Upper Hamble NVZ S810	S810	NVZ
East Hants Lambeth Group	UKGB40702G500800	Drinking Water Protected Area
Bow Lake NVZ S811	S811	NVZ
Central Hants Lambeth Group (GB40702G503800)		
South Wessex G151	G151	NVZNVZ
R. Blackwater NVZ S687	S687	NVZ
Hamble Estuary Eutrophic NVZ (TraC) ET3	ET3	NVZ
Hampshire Chalk G143	G143	NVZ
Whiteparish Trib NVZ S526	S526	NVZ
Bow Lake NVZ S811	S811	NVZ
Central Hants Lambeth Group	UKGB40702G503800	Drinking Water Protected Area
River Itchen Chalk (GB40701G505000)		
Hamble Estuary Eutrophic NVZ (TraC) ET3	ET3	NVZ
North Wey (Alton to Tilford) NVZ S678	S678	NVZ
Kingsclere and Greywell G145	G145	NVZ
Hampshire Chalk G143	G143	NVZ
R. Meon NVZ S527	S527	NVZ
Upper Hamble NVZ S810	S810	NVZ
River Itchen Chalk	UKGB40701G505000	Drinking Water Protected Area
Nun's Walk Stream NVZ S812	S812	NVZ
Bow Lake NVZ S811	S811	NVZ
Twyford	GWSGZ0153	Drinking Water Safeguard Zone
Otterbourne	GWSGZ0148	Drinking Water Safeguard Zone

Appendix 20-1 Major accidents and disasters

1 Major accidents and disasters

1.1 Introduction

1.1.1 This technical annex outlines the reasoning behind the scoping out of the topic of major accidents and disasters for the construction and operation of the Proposed Development EIA in line with Planning Inspectorate (2020) Advice Note Three: EIA Notification and Consultation, (Version 7) [52].

1.1.2 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) (Schedule 4, Section 5(d) and 8) requires the developer to assess '*the expected significant effects (on the environment) arising from the vulnerability of the Proposed Development to "major accidents or disasters" that are relevant to that development*'.

1.2 Definitions

1.2.1 For the purpose of this technical annex, the following definitions from the Institute of Environmental Management and Assessment (IEMA) Major Accidents and Disasters in EIA: A Primer [53] (hereafter referred to as the 'IEMA Primer') have been adopted:

- Accident – something that happens by chance or without expectation.
- Disaster – a natural hazard (e.g. earthquake) or a man-made/external hazard (e.g. act of terrorism) with the potential to cause an event or situation that meets the definition of a major accident.
- Major Accident – events that threaten immediate or delayed serious environmental effects to human health, welfare and/or the environment and require the use of resources beyond those of the Applicant or its appointed representatives to manage.
- Risk – the likelihood of an impact occurring, combined with the effect or consequence(s) of the impact on a receptor if it does occur.
- Risk Event – an identified, unplanned event, which is considered relevant to the Proposed Development and has the potential to result in a major accident and/or disaster, subject to its potential to result in a significant adverse effect on an environmental receptor.
- Vulnerability – describes the potential for harm as a result of an event, for example due to the sensitivity or value of receptors. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact.
- Significant environmental effect (in relation to a major accident and/or disaster assessment) – includes the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration.

1.2.2 The aim of the scoping stage of EIA, as described by the IEMA Primer, is 'to determine in more detail whether there is potential for significant effects as a result of major accidents and/or disasters associated with a development, and the resulting scope of and approach to the assessment if required.' As the major

accidents and disasters assessment considers the Proposed Development as a whole, individual elements of the project are assessed within this context.

1.2.3 In order to determine whether any risks have the potential to cause a major accident or disaster, a risk identification screening exercise has been undertaken, in line with the guidance set out in the IEMA Primer. It is included Annex A. This identifies that no credible causal linkages exist between the source of the risk, pathway to the receptor and the receptor and that other risks are able to be mitigated through design and implementation through the DCO process. The outcome of this demonstrates that, as satisfactory evidence has been provided to demonstrate that all potential risks would be mitigated during construction and operation of the Proposed Development, major accidents and/or disasters can be scoped out of the EIA at this stage.

1.3 Relevant policy and guidance

Legislation

1.3.1 The requirement to consider major accidents and disasters as part of the EIA process comes from the EIA Regulations (Schedule 4, paragraph 8), which state that an environmental statement must include:

1.3.2 ‘A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned… Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.’

1.3.3 In addition, the design, construction, management, operation, maintenance and decommissioning of the Proposed Development must adhere to the following UK legislation:

1.3.4 Health and Safety at Work etc. Act 1974 (HSWA) – the HSWA sets out requirements for employers, staff in control of premises, manufacturers and employees and also sets out the framework for the regulation of industrial health and safety in the UK. Health and safety regulations detailed under the legislation set out more comprehensive provisions but the key principle of the HSWA is that potential risks to persons must be reduced as far as is reasonably practicable with satisfactory evidence provided to show that this has been undertaken.

1.3.5 The Management of Health and Safety at Work Regulations 1999 – these regulations contain more specific details about employers’ health and safety duties under the HSWA.

1.3.6 Construction Design and Management (CDM) 2015 Regulations – places duties on clients, designers, and contractors to ensure health and safety is taken into account for the lifecycle of a project from construction to decommissioning. Under CDM Regulations, designers are required to avoid potential risks so far as is reasonably practicable through measures such as: the removal of hazards from construction, cleaning and maintenance and during the proposed use and decommissioning of the project, the reduction of risks from any remaining hazards and ensuring collective safety measures are prioritised over individual measures.

1.3.7 Further relevant legislation is set out within the Seveso III Directive which addresses the control of major accident hazards (on-shore) which involve dangerous substances. This directive is implemented by the Control of Major Accidents and Hazards (COMAH) Regulations 2015.

Water Industry Act 1991

1.3.8 The Water Industry Act details the duties and powers of water and sewerage companies in relation to water supply and waste water. This includes licence granting and conditions for water supply and sewerage, enforcement orders and financial penalties, fluoridation and charges.

Control of Major Accidents and Hazards (COMAH) Regulations 2015

1.3.9 The aim of the COMAH Regulations is to ensure that relevant businesses 'take all necessary measures to prevent major accidents involving dangerous substances [and] limit the consequences to people and the environment of any major accidents which do occur'.

Seveso III Directive 2015

1.3.10 The Seveso III Directive involves the control of onshore major accident hazards involving dangerous substances. The COMAH Regulations 2015 implement this Directive.

The Planning (Hazardous Substances) Regulations 2015

1.3.11 The Planning (Hazardous Substances) Regulations details the implementation of the land-use planning requirements on COMAH sites set out under the Seveso III Directive. A consent for hazardous substances is needed for certain specified hazardous substances or when certain substances exceed the specified quantities.

National policy

National Policy Statement for Water Resources Infrastructure 2023

1.3.12 The relevant national policies include:

- National Policy Statement for Water Resources Infrastructure 2023 [59] paragraph:
  - Safety: paragraphs 3.10.5 to 3.10.6. These paragraphs state that 'under the Environmental Impact Assessment regulations there is a requirement to consider the implications of major accidents or disasters' and 'Under the Water Industry Act 1991, water companies have powers to introduce byelaws, which could address operational issues relating to public safety, access and security of facilities.'
  - Security considerations: paragraphs 3.11.1 to 3.11.6. These paragraphs describe how 'proportionate protective security measures' should be designed into infrastructure projects. They also set out considerations for the location of projects in relation to Ministry of Defence sites, sensitive

information restrictions in applications, the grounds for a closed hearing and consultation with Defra in the event of national security implications.

National Planning Policy Framework 2021

1.3.13 The NPPF [1] sets out public safety and security in section 97 stating that *"Planning policies and decisions should promote public safety and take into account wider security and defence requirements by:*

a) Anticipating and addressing possible malicious threats and natural hazards, especially in locations where large numbers of people are expected to congregate. Policies for relevant areas (such as town centre and regeneration frameworks), and the layout and design of developments, should be informed by the most up-to-date information available from the police and other agencies about the nature of potential threats and their implications. This includes appropriate and proportionate steps that can be taken to reduce vulnerability, increase resilience and ensure public safety and security; and

b) Recognising and supporting development required for operational defence and security purposes, and ensuring that operational sites are not affected adversely by the impact of other development proposed in the area."

Local legislation

1.3.14 All Local Authorities relevant to the Proposed Development (EBC, FBC, HCC, HBC, PCC, WCC and SDNPA) bar SDNPA have emergency plans in place which are available to view on their websites. The plans outline which organisations would be responsible for leading the response to various scenarios and what the community can do to prepare for and during an incident. They are as follows:

- Eastleigh Borough Council Emergency Planning [61]
- Fareham Borough Council Emergency Response Plan [62]
- Hampshire County Council Emergency Planning [63]
- Havant Borough Council Emergency Response Plan [64]
- Portsmouth City Council Emergency Response Plan [65]
- Winchester City Council Emergency Response Plan [66]

Guidance and standards

1.3.15 At present, there is no recognised standard methodology for the assessment of major accidents and disasters within EIA. The IEMA Primer, which follows a risk identification approach, is the most commonly used approach and has therefore been used to inform the baseline and approach to scoping for this technical annex.

1.3.16 The Cabinet Office National Risk Register (2020 Edition) [67] and Hampshire Community Risk Register [68] have also been used to inform the identification of potential major accidents and natural disasters relevant to the Proposed Development.

1.4 Engagement

1.4.1 A Resilience EIA Working Group meeting was held on 14 September 2022. Representatives from the following organisations were invited:

- Health and Safety Executive (HSE)
- Hampshire and Isle of Wight Fire and Rescue Authority
- Hampshire Police and Crime Commissioner
- Hampshire Prepared Local Resilience Forum
- Environment Agency
- Relevant Local Authorities (EBC, FBC, HCC, HBC, PCC, WCC, SDNPA).

1.4.2 It was confirmed in the meeting that all stakeholders who attended are satisfied with the scoping out of all the potential risks for the topic of major accidents and disasters.

1.4.3 As part of Public Consultation 2022, stakeholder feedback was reviewed. No specific feedback was received in relation to major accidents and disasters. Other stakeholder feedback related to topics covered in Appendix A is covered in the relevant topic chapters within Volume I of the Scoping Report. These include:

- Chapter 6 Air quality and odour
- Chapter 8 Terrestrial and freshwater biodiversity
- Chapter 9 Marine biodiversity
- Chapter 10 Carbon and climate change
- Chapter 11 Land quality and ground conditions
- Chapter 17 Traffic and transport
- Chapter 18 Water environment (including flood risk)

1.4.4 Engagement with relevant stakeholders in relation to these topics will continue throughout the EIA process.

1.5 Approach to Baseline Review

1.5.1 This section describes the methods used to establish the baseline. As set out in the IEMA Primer, the baseline identifies, for each risk category, if there is a source of the risk and a pathway to a receptor. If this is the case, the presence of existing design measures, compliance with legislation, best practice and/or sufficient coverage by other topic chapters is checked. If no such mitigation exists the risk category will be scoped in to the EIA. The approach is based on the methodology set out within the IEMA Primer and is covered in more detail later in the report.

Study area

1.5.2 The study area has been determined on the basis of a likely worst case impact area, in the event of a major accident or disaster, informed by the maximum realistic extent of other topic assessment study areas, and includes the extent of the Proposed Development. External sources (including fire, weather events and

so on) which could cause a major accident or disaster to the Proposed Development are also identified and included.

Sources of baseline data

1.5.3 The following data has been used to inform the baseline:

Table 1-1: Source of baseline data

Baseline data	Source of data
Potential risks	Hampshire and Isle of Wight Community Risk Register [68] and the National Risk Register [67]
COMAH sites	HSE website and COMAH search tool [55]
Flooding	EA flooding data [69]
Fire risk	Fire and Rescue Service statistics [70] and Met Office [71]
Storm frequency and severity	Met Office [72]
Climate (maximum and minimum temperatures and precipitation)	Met Office [73]
Air quality	Defra UK AIR Air Quality Management Area (AQMA) Interactive Map [74]
Traffic	Department for Transport traffic counts and County Council collision data
Statutory designated sites	Natural England
Unexploded Ordnance	Zetica
Malicious attacks	Hampshire Local Resilience Forum [68]

1.6 Baseline conditions

Proposed Development wide conditions

1.6.1 For the topic of major accidents and disasters the baseline is addressed at a Proposed Development wide level rather than examining individual components of the Proposed Development.

1.6.2 As set out in the IEMA Primer, the National and Community risk registers have been used to identify the majority of the potential risks for the Proposed Development. Hampshire Local Resilience Forum have identified the most likely risks for the County (which are also identified at a national scale in the National Risk Register) in the Community Risk Register. These are: snow and cold, pandemic flu, industrial accidents, flooding, terrorism and widespread electricity loss. The table in Annex A. outlines the baseline information for each of these potential risks with the exception of pandemic flu as the Proposed Development is not considered to have a risk pathway. In addition, in line with the IEMA Primer, further risks have been identified based on the specific potential risks to and resulting from the Proposed Development as a result of conversations with the design team.

1.6.3 It should be noted that no COMAH sites have been identified within 4.8km (the set search distance for the HSE webmap) of the Proposed Development. Therefore, COMAH sites are not considered a risk to the Proposed Development and have not been included in the screening exercise in Annex A.

1.7 Potential effects

1.7.1 The IEMA Primer states that the major accidents and disasters topic can be scoped out of the EIA if the assessment can demonstrate:

- "there is no source-pathway-receptor linkage of a hazard that could trigger a major accident and/or disaster or potential for the scheme to lead to a significant environmental effect; or
- all possible major accidents and/or disasters are adequately covered elsewhere in the assessment or covered by existing design measures or compliance with legislation and best practice."

1.7.2 However, if the above cannot be demonstrated then the topic must be scoped in.

1.7.3 Unlike other topics within EIA, major accidents and disasters does not scope in potential effects but rather the potential for a risk event to occur.

1.7.4 In order to determine whether the above requirements are met, a risk identification exercise has been undertaken (see Annex A.) in line with the guidance set out in the IEMA Primer. The risk identification considers the current risk profile identified within the Community Risk Register and consideration of specific risks relating to the construction and operation of Proposed Development. It looks at the potential for a source-pathway-receptor linkage in terms of risks to environmental receptors such as designated environmental sites, residents local to the Proposed Development and workers on and in close proximity to the site, local businesses and cultural heritage and archaeology during construction and operation of the Proposed Development. If a source-pathway-receptor linkage is present it then examines to what extent the risk generated is addressed by mitigation and if, with this mitigation in place and secured through the DCO consent process, the risk could lead to a major accident and/or disaster.

1.7.5 To determine the risk of a significant effect the likelihood of an event occurring is considered, followed by the potential consequence should the event occur. When examining the consequence the following is considered:

- The geographic extent of the risks with effects outside the Proposed Development are more likely to be considered significant.
- The duration of the effects from the risks with permanent or long-lasting effects likely to be considered significant.
- The severity of the effects in terms of the number, degree of harm to those impacted and the response effort required with effects requiring the mobilisation of a substantial civil emergency response more likely to be considered significant.
- The sensitivity of the identified receptors.
- The effort required to restore the environment to its previous state with substantial efforts likely to be considered significant.

1.7.6 The IEMA Primer also identifies significance based on criteria adopted from Annex VI of the Seveso III Directive which details the 'criteria for the notification of a major accident to the Commission'. Using this as a reference, the significance threshold for the Proposed Development for major accidents and disasters is determined to be anything which could cause loss of life or permanent injury and/or long-lasting damage to an environmental receptor.

1.7.7 Effects from decommissioning of the Proposed Development are expected to be no greater than those identified during the construction phase, and are therefore assessed as being the same as construction effects as a worst case scenario. Please refer to Chapter 3 Description of the Proposed Development, section 3.7 for further information on decommissioning.

Construction effects

1.7.8 Following the risk identification exercise (see Annex A.), no potential risk events, which could occur during construction, have been scoped into the assessment.

1.7.9 The following potential risk events are considered to be adequately mitigated (for full details see Annex A.):

- Flooding[2]
- Fire
- Severe weather[3]
- Air quality
- Widespread electricity failure[4]
- System failures[5]
- Transport accidents
- Industrial accidents
- Pollution[6]
- Unexploded Ordnance (UXO)[7]
- Attacks[8]

Operation effects

1.7.10 Following the risk identification exercise (see Annex A.), no potential risk events, which could occur during operation, have been scoped into the assessment.

1.7.11 The following potential risk events are considered to be adequately mitigated:

- Flooding[2]
- Fire

[2] Defined as surface water flooding, flash flooding or failure flooding by dam or reservoir.
[3] Including localised flooding, heatwaves, drought, storms, low temperatures and heavy snow.
[4] Defined as power loss.
[5] Defined as loss of and/or damage to services such as mains water, gas pipes and sewage drainage.
[6] Caused by a polluting material, such as fuel or heavy metals, leading to damage a sensitive receptor.
[7] Defined as unknown remnants of explosive weapons which may still be at risk of detonation.
[8] Defined as an act of terrorism or malicious attack on the site.

- Severe weather[3]
- Air Quality
- Widespread electricity failures[4]
- System failures[5]
- Transport accidents
- Industrial accidents[9]
- Pollution incidents[6]
- UXO[7]
- Attacks[8]

1.8 Limitations and assumptions

1.8.1 The following assumptions have been applied to the risk identification exercise (Annex A.) when considering risk events:

- Major accidents and/or disasters associated with construction and operation activities that fall within the scope of health and safety legislation (see section 1.3) and associated obligations are not considered.
- The risk identification exercise does not consider risks where there is no 'source-pathway-receptor' linkage.
- The risk identification exercise does not consider major accidents and/or disasters where risk events are not applicable to the geographic location of the Proposed Development e.g. volcanic activity.
- Risk events that are low likelihood/low consequence are not considered as they do not meet the criteria to be classed, within a risk assessment, as a significant environmental effect and therefore do not satisfy the definition of a major accident and/or disaster.
- Risk events that are considered to be high likelihood/high consequence are not present having been already mitigated or design out as these would be considered unacceptable to the viability of the Proposed Development.

1.9 Summary

1.9.1 In conclusion, the Proposed Development is not considered to lead to a major accident and/or disaster during its construction or operation as risks will be appropriately mitigated as set out in Annex A.

1.10 Glossary and abbreviations

Term	Definition
Accident	Something that happens by chance or without expectation.

[9] Defined as an incident occurring in a workplace associated with workplace processes and/or infrastructure which, in this instance, includes explosions as a result of the movement of hazardous chemicals and pipe rupture.

Disaster	A natural hazard (e.g. earthquake) or a man-made/external hazard (e.g. act of terrorism) with the potential to cause an event or situation that meets the definition of a major accident.
Major Accident	Events that threaten immediate or delayed serious environmental effects to human health, welfare and/or the environment and require the use of resources beyond those of the Applicant or its appointed representatives to manage.
Risk	The likelihood of an impact occurring, combined with the effect or consequence(s) of the impact on a receptor if it does occur.
Risk event	An identified, unplanned event, which is considered relevant to the Proposed Development and has the potential to result in a major accident and/or disaster, subject to its potential to result in a significant adverse effect on an environmental receptor.
Vulnerability	Describes the potential for harm as a result of an event, for example due to the sensitivity or value of receptors. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact.
Significant environmental effect (in relation to a major accident and/or disaster assessment)	Includes the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration.
Flooding	Defined as surface water flooding, flash flooding or failure flooding by dam or reservoir.
Severe weather	Includes localised flooding, heatwaves, drought, storms, low temperatures and heavy snow.
Widespread electricity failure	Defined as power loss.
System failures	Defined as loss of and/or damage to services such as mains water, gas pipes and sewage drainage.
Pollution	Caused by a polluting material, such as fuel or heavy metals, leading to damage a sensitive receptor.
Unexploded ordnance	Defined as unknown remnants of explosive weapons which may still be at risk of detonation.
Attacks	Defined as an act of terrorism or malicious attack on the site.

Abbreviation	Definition
UXO	Unexploded Ordnance
IEMA	Institute of Environmental Management and Assessment
HSE	Health and Safety Executive
HSWA	Health and Safety at Work etc. Act 1974
CDM	Construction Design and Management
COMAH	Control of Major Accidents and Hazards

Annex A - Risk identification screening

Risk Event [67]	Source	Pathway	Receptor	Baseline Information	Reasonable worst consequence if event did occur	Mitigation	Could this lead to a major accident and/or disaster with existing mitigation in place?
Construction stage risks							
Flooding	Extreme weather event	Flood event Surface water flooding Flash flooding Failure flooding by dam or reservoir	Environmental designations Individuals and public health Cultural heritage and archaeology	Chapter 18 Water environment (including flood risk) states that different areas of the Proposed Development pass through Flood Zones 1, 2 and 3. The risk of surface water flooding across the Proposed Development varies from low to high risk. A few of the areas are also at risk of failure flooding by a dam or reservoir. See Chapter 18 Water environment (including flood risk) for location specific details.	Fatality/injury to public Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	Flood event The construction site compounds would be sited to avoid identified flood risk zones. Where the works occur within a flood risk zone, the Principal Contractor would be obliged to carry out a risk assessment and install necessary control measures to mitigate the risk of flooding. This would be secured through the DCO process.	No
Fire	Wildfire Fire caused by construction machinery or other construction activity incident Fire caused from natural source such as lighting strike Fire caused by human act eg. cigarette butt	Dry conditions due to drought and/or heatwave enabling a fire to spread to construction machinery and other machinery and buildings Fire spreading from construction machinery to surrounding environment and infrastructure	Environmental designations Local community and businesses Cultural heritage and archaeology	In 2021, there were 147,295 fires attended by the Fire and Rescue Service (FRS) [75] in England. Of these, 5453 were classed as 'other outdoors' primary fires involving people or properties and 86,082 were secondary fires not involving people or properties fires. The UK Fire Severity Index [71] produces a map forecast (up to 5 days ahead) showing the risk of fire in locations across the UK, based on measurements including humidity and precipitation. Given the Proposed Development is located in the south of England, which experiences higher average temperatures and lower average volumes of precipitation than other parts of the country, the risk of a fire is likely to be greater than in other parts of the country.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	Fire Contractor should ensure emergency plans are written as part of the development of the Proposed Development which would be agreed with Local Authorities, utilities and blue light authorities. Environmental management plans would set out best practice measures with regards to the storage of fuel and plant. This would be secured through the DCO process.	No
Severe weather	Localised flooding Heatwaves Drought Storms	Pollution event (caused by movement of construction related contaminants, such as fuel spillage or movement of	Environmental designations Local community and businesses	Chapter 10 Carbon and climate change states that Thornley Island meteorological station (grid reference 475640, 103025) has been selected for meteorological data as it is considered	Fatality/injury to public Damage to infrastructure	Pollution See pollution section for details of mitigation. Fire	Pollution: No Fire: No Traffic: No

Risk Event [67]	Source	Pathway	Receptor	Baseline Information	Reasonable worst consequence if event did occur	Mitigation	Could this lead to a major accident and/or disaster with existing mitigation in place?
	Low temperatures and heavy snow	contaminated ground) in hydrologically connected watercourse as a result of flooding Wildfire caused by drought, heatwaves or lightning strike spreading to construction machinery, fuel storage, other buildings and the surrounding environment Snow and ice causing a construction traffic accident or other construction accident.	Cultural heritage and archaeology	to have appropriate weather conditions for the project. Thornley Island annual average maximum temperature (over 12 months) was 14.8°C and the minimum was 7.7°C compared to the UK average of 12.8°C and 5.5°C. Average annual rainfall for Thornley Island is 767.7mm, lower than the UK average of 1163.0mm. The mean wind speed at Thornley Island is slightly higher at 9.6 knots compared to 9.3 knots for the UK average. There were seven weather events categorised as storms by the Met Office in the 2020/2021 storm season in the UK [72]. The south-east of the UK is also more vulnerable to periods of drought than other regions due to the high population density and higher average annual temperatures and lower precipitation. The frequency and severity of extreme weather events, such as storms and droughts, is expected to increase in the future due to climate change.	Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	See fire section for details of mitigation. Traffic accident See transport accidents section for details of mitigation. Flooding See flooding section for details of mitigation.	
Air quality	Construction dust	Construction dust leading to damage to human health and species and habitats	Environmental designations Local community and businesses	Chapter 6 Air quality and odour states that baseline air quality conditions across the corridor route are generally good with only one AQMA (Eastleigh AQMA No.2 declared for annual mean NO2) within the study area. All maximum background pollutant concentrations within study area are below the respective Air Quality Objectives.	Injury to public Damage to habitats and injury/fatality of species individuals	Chapter 6 Air quality and odour states that, during construction, there could be an increase in dust emissions associated with the Proposed Development. Given that Chapter 6 Air quality and odour proposes to scope in potential impacts from construction dust on human and ecological receptors, this risk is considered to be adequately covered by this section of the EIA and can therefore be scoped out of the major accidents and disasters assessment.	No

Risk Event [67]	Source	Pathway	Receptor	Baseline Information	Reasonable worst consequence if event did occur	Mitigation	Could this lead to a major accident and/or disaster with existing mitigation in place?
Widespread electricity failure	Construction work causing electricity pylons to fall Electricity failure causing construction machinery to fail Network outage	Damage to electricity cables during construction leading to a widespread outage for the surrounding area and Proposed Development Falling of pylons and wires onto local roads	Local community and businesses	Utilities plans for the study area show that there are underground and overground electricity cables crossing various locations across the Proposed Development.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals Disruption to local networks, infrastructure and community	During construction a standard management plan would be put in place in order to mitigate the risk of damage to utilities. This would include the procurement of detailed utility plans, prior to any ground being broken, to inform the Principal Contractor's Construction Phase Plan and the Permit to Dig. The management plan would also detail emergency response measures which would be employed should a utility be damaged. This would be secured through the DCO process.	No
System failures	Accidental strike of a live service connection (e.g. sewer, water main, high pressure gas main) by construction machinery	Pollution event caused by damage to storm or foul water drainage or gas mains Fire risk due to gas leak Health risk due to gas leak	Local community and businesses Environmental designations Cultural heritage and archaeology	Utilities plans for the study area show multiple gas pipes, including high pressure pipes, water mains, wastewater pipes and electricity cables, underground and overground, crossing the corridor. There is also a virtual gas porting facility off Ports Hill Down Road.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals Disruption to local networks, infrastructure and community Damage to cultural heritage and archaeology	During construction a standard management plan would be put in place in order to mitigate the risk of damage to utilities. This would include the procurement of detailed utility plans, prior to any ground being broken, to inform the Principal Contractor's Construction Phase Plan and the Permit to Dig. The management plan would also detail emergency response measures which would be employed should a utility be damaged. This would be secured through the DCO process.	No
Transport accidents	Transport accident involving construction vehicles	Collision between construction vehicles and/or non-site related vehicles	Local community Environmental designations	Chapter 17 Traffic and transport states that potential accident and safety risks for local residents and vulnerable road users during the construction stage would be assessed as part of the next stage of assessment.	Fatality/injury to public Disruption to local networks, infrastructure and community	It is considered that Chapter 17 Traffic and transport would address the potential impact of this risk sufficiently and there would therefore be no residual risk of a major accident or disaster.	No
Pollution incidents	Flash flooding Surface water flooding Fuel spillage	Pollution event (caused by construction related fuel spillage or movement of	Local community and businesses Environmental designations	There are multiple sensitive receptors nearby which could be affected by pollution events including Chichester and Langstone Harbours SPA and	Fatality/injury to public Damage to habitats and injury/fatality of species individuals	Pollution The Contractor's construction phase plan and environmental management plan would	No

Risk Event [67]	Source	Pathway	Receptor	Baseline Information	Reasonable worst consequence if event did occur	Mitigation	Could this lead to a major accident and/or disaster with existing mitigation in place?
	Ground contamination	contaminated ground) in hydrologically connected watercourse caused by flooding Pollution event related to release of ground contaminants migrating due to construction work eg. via runoff Direct damage to surrounding environment by fuel spillage Release of ground gases	Cultural heritage and archaeology	Ramsar, Solent Maritime SAC and River Itchen SAC and SSSI (for a full list see Chapter 8 Terrestrial and freshwater biodiversity and Chapter 9 Marine biodiversity). The most likely pollution pathway is through flooding. For information on how flooding is linked to this baseline, see the relevant section within this table and Chapter 18 Water environment (including flood risk). Chapter 11 Land quality and ground conditions identifies multiple sources of potential contamination including historic and modern landfills, historic sewage works, contamination associated with the railway and a corn mill, an infilled pond and watercourse, a garage/depot/warehouse, old chalk pits, disused sand pits, water treatment works, an old quarry, a colliers pit, reservoirs, farms, a hospital, an oil fuel reservoir and a former brick works. In addition, a geoenvironmental assessment for a previous planning application for an alternative development for Site 72 (a section of the Proposed Development) highlighted contaminants present in the made ground including asbestos, groundwater impacted by ammonium and ground gas composed of elevated concentrations of methane and carbon dioxide.	Damage to cultural heritage and archaeology	contain risk assessments covering any potential pollution hazard and controls to prevent incidents. This would be secured through the DCO process. The Contractors would also adhere to the standards set out in the Guidance for Safe Intrusive Activities on Contaminated or Potentially Contaminated Land.	
UXO	Explosions	Disturbance of UXO during construction leading to explosion Explosion at submarine port	Local community and businesses Environmental designations Cultural heritage and archaeology	A UXO risk check has been undertaken for Budds Farm WTW and identifies that the land area is classed as low risk for UXO with the marine portion classed as moderate risk. As this is only a small area, a UXO risk check would be undertaken to cover the entire Proposed Development and included within future stages of the EIA.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	UXO Any UXO mitigation measures would be detailed within a management plan including confirmation of the need for further investigations and safe working procedures. This would be secured through the DCO process. Nuclear submarine It is not considered that the construction of the Proposed	UXO: No Nuclear submarine: No

Risk Event [67]	Source	Pathway	Receptor	Baseline Information	Reasonable worst consequence if event did occur	Mitigation	Could this lead to a major accident and/or disaster with existing mitigation in place?
				PCC emergency planning documents shows that areas of the Proposed Development are within a 5km buffer of the nuclear submarine port.		Development is any more vulnerable to the occasional docking of nuclear submarines than any other development within the 5km buffer zone.	
Attacks	Terrorist attacks on the Proposed Development	Explosion at Proposed Development caused by Improvised Explosive Device (IED)	Local community and businesses Environmental designations Cultural heritage and archaeology	Hampshire Local Resilience Forum have identified terrorism as a potential risk in the region within the Community Risk Register.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	Attacks The Principal Contractor (PC) shall be responsible for the setting up of their own compound during construction and shall confirm how this would be secured with an appropriate level of site security. The PC would be responsible for the security of the site at all times during construction. Materials should be placed in safe areas to reduce the risk to the public and workforce. Security measures should be adequate to exclude the public from the site. This would be secured through the DCO process.	No
Bird strike	Construction of the lagoons is likely to increase the number of birds at the site at some point during the construction phase.	Increased numbers of birds flying into the flight path for Southampton Airport. Birds flying into the engines of planes could cause them to crash.	Local community and businesses Environmental designations Cultural heritage and archaeology	There are 36 statutory designated sites within the Zone of Influence of the Proposed Development, including SPAs, SACs, Ramsar sites, SSSIs and LNRs. There are internationally important populations of Brent Goose and wading birds and large records of species listed as Annex 1 under the Birds Directive. For further information, see Chapter 8 Terrestrial and freshwater biodiversity.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	A bird strike risk assessment would be undertaken which would identify if there is the potential for a significant effect. If this is the case, the bird strike risk assessment would recommend measures to reduce the risk which would be secured through the DCO process. It is therefore considered that the risk would be adequately covered by the risk assessment.	No
Operation stage risks							
Flooding	High pressure water pipe leak	Flooding event caused by high pressure pipe leak Explosive force of pipe rupture leading to significant infrastructure damage	Local community Environmental designations Cultural heritage and archaeology	See industrial accidents.			No

Risk Event [67]	Source	Pathway	Receptor	Baseline Information	Reasonable worst consequence if event did occur	Mitigation	Could this lead to a major accident and/or disaster with existing mitigation in place?
Fire	Wildfire Fire caused from natural source such as lighting strike Fire caused by human act e.g. cigarette butt	Dry conditions due to drought and/or heatwave enabling a fire to spread above ground infrastructure and buildings	Environmental designations Local community and businesses Cultural heritage and archaeology	In 2021, there were 147,295 fires attended by the Fire and Rescue Service (FRS) [75] in England. Of these, 5453 were classed as 'other outdoors' primary fires involving people or properties and 86,082 were secondary fires not involving people or properties fires. The UK Fire Severity Index [71] produces a map forecast (up to 5 days ahead) showing the risk of fire in locations across the UK, based on measurements including humidity and precipitation. Given the Proposed Development is located in the south of England, which experiences higher average temperatures and lower average volumes of precipitation than other parts of the country, the risk of a fire is likely to be greater than in other parts of the country.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	Fire Operator should ensure emergency plans are written as part of the operation of the Proposed Development which would be agreed with Local Authorities, utilities and blue light authorities. This would be secured through the DCO process.	No
Severe weather	Storms leading to high tides and storm surges	Pollution event in hydrologically connected watercourse caused by flooding from high tides and storm surges affected water treatment works	Local community Environmental designations Cultural heritage and archaeology	Chapter 10 Carbon and climate change states that Thornley Island meteorological station (grid reference 475640, 103025) has been selected for meteorological data as it is considered to have appropriate weather conditions for the project. Thornley Island annual average maximum temperature (over 12 months) was 14.8°C and the minimum was 7.7°C compared to the UK average of 12.8°C and 5.5°C. Average annual rainfall for Thornley Island is 767.7mm, lower than the UK average of 1163.0mm. The mean wind speed at Thornley Island is slightly higher at 9.6 knots compared to 9.3 knots for the UK average. There were seven weather events categorised as storms by the Met Office in the 2020/2021 storm season in the UK [72]. The south-east of the UK is also more vulnerable to periods of drought than other regions due to the high population density and higher	Injury to public Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	Pollution event A standard environmental management plan would be put in place, for the operation of the Proposed Development, which would mitigate the risk of damage by storm surges and flooding by high tides if this is a risk concluded to be relevant. This would be secured through the DCO process. At the time of writing, it is unknown if this would be a risk as the preliminary Flood Risk Assessment is currently in progress.	No

Risk Event [67]	Source	Pathway	Receptor	Baseline Information	Reasonable worst consequence if event did occur	Mitigation	Could this lead to a major accident and/or disaster with existing mitigation in place?
				average annual temperatures and lower precipitation. The frequency and severity of extreme weather events, such as storms and droughts, is expected to increase in the future due to climate change.			
Air Quality	No source of air pollution during operation identified.	As there is no source, there cannot be a pathway to a receptor during operation.	As there is no source or pathway, there cannot be a receptor for potential air quality impacts.	Operational emissions have been scoped out of Chapter 6 Air quality and odour as the operational traffic would not breach any thresholds for air quality assessment.	None identified as source-pathway receptor linkage is not present.	None required.	No
Widespread electricity failure	Network outage	General mains network outage causing the Proposed Development to lose power	Local community	In the event of a power outage when the Proposed Development is needed to provide water to the community it serves, bottled water would be provided at various designated locations until the supply is restored.	None identified as source-pathway receptor linkage is not present.	None required.	No
System failures	Utilities are present on-site but none are anticipated to be a significant source of a major accident or disaster during the operation of the Proposed Development	As there is no source, there cannot be a pathway to a receptor during operation.	As there is no source or pathway, there cannot be a receptor for potential system failures.	Utilities plans for the study area show multiple gas pipes, including high pressure pipes, water mains, wastewater pipes and electricity cables, underground and overground, crossing the corridor. There is also a virtual gas porting facility off Ports Hill Down Road.	None identified as source-pathway receptor linkage is not present.	None required.	No
Transport accidents	Transport accident involving operational vehicles transporting hazardous substances Hazardous chemicals transported to, stored and used on-site Transport accident involving operational vehicles	Explosions on the way to site caused by collisions involving operational vehicles transporting hazardous chemicals Pollution of a watercourse, groundwater and surface water receptors caused by spillage of hazardous chemicals Collision between site vehicles and/or non-site related vehicles	Local community Environmental designations	Chapter 17 Traffic and transport states that traffic accidents and safety during operation would be assessed in the Traffic and Transport ES chapter. However, it is assumed this would purely cover collisions and would not include an assessment of related risks, such as the transportation of hazardous chemicals. For the baseline for the hazardous chemicals to be used on-site see the industrial accidents section.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals	Explosions See industrial accidents section. Pollution incident See industrial accidents section. Transport accident The operator of the Proposed Development would have emergency plans in place to manage a transport accident were one to occur. Details of this would be provided when available and would be secured through the DCO process.	Transport accidents: no Explosions and pollution: no
Industrial accidents	Hazardous chemicals transported to, stored and used on-site	Explosions on the way to Proposed Development caused by collisions involving	Local community Environmental designations	Various chemicals would be transported to, stored and used during operation of the Proposed Development. These include:	Fatality/injury to public Damage to infrastructure	Chemical Explosions Southern Water's Wholesale Water Services Manual (WSM) 203.10 and Safety	Chemical explosions: yes Pollution events: no

Risk Event [67]	Source	Pathway	Receptor	Baseline Information	Reasonable worst consequence if event did occur	Mitigation	Could this lead to a major accident and/or disaster with existing mitigation in place?
	Transport accident involving operational vehicles transporting hazardous substances High pressure water pipe leak	operational vehicles transporting hazardous and flammable chemicals Pollution of a watercourse, groundwater and surface water receptors caused by spillage of hazardous chemicals Flooding event caused by high pressure pipe leak Explosive force of pipe rupture leading to significant infrastructure damage	Cultural heritage and archaeology	antiscalent, hydrochloric acid, hydrogen peroxide, sodium hydroxide, citric acid and sodium bisulphite. A Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) assessment would be carried out to determine their levels of explosiveness but they are all hazardous and explosive to some degree. A Hazard and Operability Study (HAZOP) assessment would also be undertaken to assess the risk of any potential issues with the design of the Proposed Development or its processes. An underground pipeline approximately 40 kilometres long would transfer approximately 90 million litres of water per day at the peak of a drought, from Havant Thicket Reservoir to Otterbourne WSW via a HLPS located at the proposed WRP. In order to transfer this volume of water quickly the water would need to be pumped under high pressure though exact velocities are not currently known.	Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	Instructions Book (SIB) 053 set out the standard for chemical management during their delivery. It includes the following safety measures: All chemicals are tested by a qualified person before discharge into storage tanks; Appropriate PPE is worn by all persons involved in the delivery process; Ensure emergency spillage kit is available on-site; and The delivery procedure in SIB 053 must be followed. Given the risk of transport accidents would be dealt with in Chapter 17 Traffic and transport, it is not considered that there is a significant risk associated with an explosion associated with chemicals caused by a transport accident. If this were to occur,the pollution prevention management plan would be employed as well as the aforementioned safety measures for handling dangerous chemicals. Pollution event Once on-site, the chemicals would be stored in accordance with the standards set out in WSM 203.10, Mechanical and Electrical Specifications (MED) 4008, SIB 052 and Environmental Management System Manual (EMS) 234. These include the following measures: maintenance of suitable temperature for the chemical being stored; expiry dates of chemicals clearly recorded;	Flooding and pipe rupture: no

Risk Event [67]	Source	Pathway	Receptor	Baseline Information	Reasonable worst consequence if event did occur	Mitigation	Could this lead to a major accident and/or disaster with existing mitigation in place?
						suitable strong containers and bunds are used for storage; maximum capacity of storage containers must not be exceeded; only compatible chemicals must be stored together; inspections of storage tanks must be undertaken between every 1 to 5 years depending on the chemical being stored; and all above ground containers must be situated on hardstanding, more than 10m from a watercourse or drain within a bund. In the event of a spillage or leak, the following measures would be undertaken, as laid out in WSM 303.06A: no chemicals must be allowed to drain into watercourses unless there is a threat to human life or injury; all appropriate PPE must be worn when dealing with a spillage; spillages less than 25 litres must be contained with sand or earth bunds before being reported to management; larger spillages must be reported to the Regional Control Centre and management; if water quality is threatened by a spillage, the station must be immediately shut; and any concerns regarding leaks from a container or bund must be immediately reported. Flooding and pipe rupture The high pressure pipeline would aim, as far as possible, to design out the risk of a pipe failure or rupture and the	

Risk Event [67]	Source	Pathway	Receptor	Baseline Information	Reasonable worst consequence if event did occur	Mitigation	Could this lead to a major accident and/or disaster with existing mitigation in place?
						associated explosive and flooding damage this could cause. If any section is laid directly in the ground, a maximum 12m buffer would be installed on either side of the pipe, depending on the depth and diameter of the Proposed Underground Pipeline, to mitigate the potential damage caused by a rupture. In addition, a management plan would be put in place which would detail the emergency response procedures which would be carried out should the event occur. This would include liaison with blue light authorities for evacuation of affected residents and businesses, cordoning off of affected areas and temporary housing where necessary for affected residents. This would be secured through the DCO process.	
Pollution	Hazardous chemicals transported to, stored and used on-site Transport accident involving operational vehicles transporting hazardous substances	Pollution of a watercourse, groundwater and surface water receptors caused by spillage of hazardous chemicals Flooding event caused by high pressure pipe leak	Local community Environmental designations Cultural heritage and archaeology	See industrial accidents section for baseline.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	See industrial accidents section for mitigation.	No
UXO	Explosions	Explosion at submarine port	Local community and businesses Environmental designations Cultural heritage and archaeology	PCC emergency planning documents shows that areas of the Proposed Development are within a 5km buffer of the nuclear submarine port.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	Nuclear submarine It is not considered that the operation of the Proposed Development is any more vulnerable to the occasional docking of nuclear submarines than any other development within the 5km buffer zone.	No

Risk Event [67]	Source	Pathway	Receptor	Baseline Information	Reasonable worst consequence if event did occur	Mitigation	Could this lead to a major accident and/or disaster with existing mitigation in place?
Attacks	Terrorist attacks on the Proposed Development	Explosion at Proposed Development caused by IED Interference with the water quality	Local community and businesses Environmental designations Cultural heritage and archaeology	Hampshire Local Resilience Forum have identified terrorism as a potential risk in the region within the Community Risk Register.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	Emergency plans would be developed and agreed with blue light authorities to ensure a coordinated response can be deployed in the event of an attack. For interference with the water supply and/or quality, bottled water stations would be set up to supply affected residents when required.	No
Bird strike	Construction of the lagoons is likely to increase the number of birds at the site during the operational phase of the Proposed Development	Increased numbers of birds flying into the flight path for Southampton Airport. Birds flying into the engines of planes could cause them to crash.	Local community and businesses Environmental designations Cultural heritage and archaeology	Chapter 8 Terrestrial and freshwater biodiversity states that there are 28 statutory designated sites within 2km of the Scoping Area of both national and international designation as well as 434 non-statutory designated sites within 2km of the Scoping Area. Many of these sites are listed for the presence of bird species, including Brent goose and Sandwich tern. For further details see Chapter 8 Terrestrial and freshwater biodiversity.	Fatality/injury to public Damage to infrastructure Damage to habitats and injury/fatality of species individuals Damage to cultural heritage and archaeology	A bird strike risk assessment would be undertaken which would identify if there is the potential for a significant effect. If this is the case, the bird strike risk assessment would recommend measures to reduce the risk which would be secured through the DCO process. It is therefore considered that the risk would be adequately covered by the risk assessment.	No

Abbreviations

Abbreviation	Definition
AQMA	Air Quality Management Area
BGS	British Geological Society
CAMS	Catchment Abstraction Management Strategy
CDM	Construction Design and Management
COMAH	Control of Major Accidents and Hazards
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EBC	Eastleigh Borough Council
EHDC	East Hampshire District Council
EIA	Environmental Impact Assessment
ES	Environmental Statement
FBC	Fareham Borough Council
FRS	Fire and Rescue Service
GWDTE	Groundwater dependent terrestrial ecosystems
GWSWI	Groundwater -surface water Interactions
HBC	Havant Borough Council
HCC	Hampshire County Council
HIA	Hydrogeological Impact Assessment
HLPS	High Lift Pumping Station
HMWP	Hampshire Minerals and Waste Plan
HSE	Health and Safety Executive
HSWA	Health and Safety at Work etc. Act 1974
IED	Improvised Explosive Device
IEMA	Institute of Environmental Management and Assessment
IFCA	Inshore Fisheries and Conservation Authorities
LNR	local nature reserves
LSO	Long Sea Outfall
m AOD	metres Above Ordnance Datum
MCZ	Marine Conservation Zone
NPPF	National Planning Policy Framework
NVZ	Nitrate Vulnerable Zone
PC	Principle Contractor
PCC	Portsmouth City Council
PEI	Preliminary Environmental Information
PS	Pumping Station
PWS	Public water supply
RAMS	Risk Assessment and Method Statements

Abbreviation	Definition
SAC	Special Area of Conservation
SDNP	South Downs National Park
SDNPA	South Downs National Park Authority
SIB	Safety Instructions Book
SINC	Sites of Importance for Nature Conservation
SOM	Size of Maturity
SPA	Special Protection Areas
SPD	Supplementary Planning Document
SPG	Supplementary Planning Guidance
SPZ	Source Protection Zones
SSSI	Sites of Special Scientific Interest
TraC	Transitional and coastal
UXO	Unexploded Ordnance
WCC	Winchester City Council
WFD	Water Framework Directive
WRP	Water Recycling Plant
WSM	Water Services Manual
WSW	Water Supply Works
WTW	Wastewater Treatment Works

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