NORTH FALLS

Offshore Wind Farm

Groundwater Risk Assessment and Monitoring Plan - Private Water Supplies and Licenced Abstractions (Part 1 of 4)

Document Reference:	9.66
Volume:	9
Date:	May 2025
Revision:	0

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Project	North Falls Offshore Wind Farm
Document Title	Groundwater Risk Assessment and Monitoring Plan - Private Water Supplies and Licenced Abstractions (Part 1 of 4)
Document Reference	9.66
Supplier	Royal HaskoningDHV
Supplier Document ID	PB9244-RHD-ZZ-ON-RP-ON-0384

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Revision	Date	Status/Reason for Issue	Originator	Checked	Approved
0	May 2025	Deadline 5	RHDHV	NFOW	NFOW

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Glossary of Acronyms

BGS	British Geological Society
CBS	Cement Bound Sand
CSM	Conceptual site model
EA	Environment Agency
GI	Green Infrastructure
GwMP	Groundwater Monitoring and Mitigation Plan
GwRA	Groundwater risk assessment
HDD	Horizontal Directional Drill
km	Kilometre
LNR	Local Nature Reserve
MAGiC	Multi-Agency Government Information for the Countryside
m	Metre
NE	North East
NFOW	North Falls Offshore Wind Farm Limited
NVZ	Nitrate Vulnerable Zone
NW	North West
OD	Ordnance Datum
PRA	Preliminary Risk Assessment
PSD	Particle Size Distribution
PWS	Private water supplies
SE	South East
SSSI	Site of Special Scientific Interest
SW	South West
TCC	Temporary construction compounds

Glossary of Terminology

landfall	The location where the offshore export cables come ashore at Kirby Brook.
horizontal directional drill (HDD)	Trenchless technique to bring the offshore export cables ashore at landfall. The technique will also be the primary trenchless technique used for installation of the onshore export cables at sensitive areas of the onshore cable route.
onshore export cables	The cables which take the electricity from landfall to the onshore substation. These comprise High Voltage Alternative Current (HVAC) cables, buried underground.
onshore project area	The boundary within which all onshore infrastructure required for the Project will be located (i.e. landfall; onshore cable route, accesses, construction compounds; onshore substation and cables to the National Grid substation)
onshore cable route	Onshore route within which the onshore export cables and associated infrastructure would be located.
onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the Project so that it can be connected to the National Grid.
onshore substation construction compound	Area set aside to facilitate construction of the onshore substation. Will be located adjacent to the onshore substation.
onshore substation works area	Area within which all temporary and permanent works associated within the onshore substation are located, including onshore substation, construction compound, access, landscaping, drainage and earthworks.
temporary construction compound	Area set aside to facilitate construction of the onshore cable route. Will be located adjacent to the onshore cable route, with access to the highway where required.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The Project Or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
trenchless crossing	Use of a technique to install limited lengths of cable below ground without the need to excavate a trench from the surface, used in sensitive areas of the onshore cable route to prevent surface disturbance. Includes techniques such as HDD.

1 Introduction

1. North Falls Offshore Wind Farm Limited (NFOW) has commissioned Royal HaskoningDHV to complete a groundwater risk assessment (GwRA) in relation to private water supplies and licenced abstractions within and surrounding the onshore project area for the North Falls Offshore Wind Farm (herein referred to as 'North Falls or 'the Project').

2. The onshore project area is located within the District of Tendring in Essex, between Great Holland (National Grid Reference 622732 Easting, 218019 Northing) and east of Ardleigh (National Grid Reference 607258 Easting, 229418 Northing), and comprises land required for the construction and operation of the Project's onshore transmission infrastructure (i.e. landfall, onshore cable route and onshore substation works area). The assessment will inform the Project detailed in Section 1.1. A plan showing the onshore project area is shown on Figure 1.

3. This report should be read in conjunction with North Falls Environmental Statement Chapter 19 Ground Conditions and Contamination (July 2024) **[APP-033]** and Appendix 19.1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report (July 2024) **[APP-112]**.

1.1 The Project

4. NFOW is proposing to undertake the following onshore construction works, relevant to this GwRA, as described in the North Falls Environmental Statement Chapter 19 Ground Conditions and Contamination (July 2024) **[APP-033]**:

- Up to 11 temporary construction compounds (TCC). Assumed to include no below ground development except for shallow topsoil stripping.
- Up to 192 jointing bays – 4m x 15m with a depth of 2.15 metres below ground level (m bgl).
- Trenched onshore cable route to a maximum depth of 2m bgl.
- Trenchless crossing points at depths of up to 20m bgl (trenchless crossing locations shown on Figure 1).
- An onshore substation (shown on Figure 1), with maximum dimensions of approximately 280m x 210m. The piling solution for the onshore substation area will be determined post consent, following ground investigations (GI).
- An onshore substation works area (shown on Figure 1), encompassing additional land required for ancillary infrastructure for the onshore substation (i.e. access, drainage, landscaping, environmental mitigation and enhancements) and to facilitate the onshore substation's construction.

1.2 Project Background

5. Initial consultation with stakeholders including Tendring District Council and Environment Agency (EA) was undertaken in July 2023 to identify private water supplies (PWS) and licensed groundwater abstractions within a 1km radius of the onshore project area. The identified abstractions within 1km of the onshore project area are listed in Appendix 19.1 Geo-Environmental Desk Study and PRA Report (July 2024) **[APP-112]**.

6. North Falls Environmental Statement Chapter 19 Ground Conditions and Contamination (July 2024) **[APP-033]** and Appendix 19.1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report (July 2024) **[APP-112]** included a baseline review of the geology, hydrogeology and hydrology used to inform a conceptual site model (CSM). This CSM was used to identify where hydraulic connection exists between the Project and identified groundwater receptors.

7. To understand the potential effects of the Project upon PWS the preliminary review presented in Appendix 19.1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report (July 2024) **[APP-112]** has been updated drawing on further baseline data collected since the submission of the Environmental Statement.

1.3 Scope of GwRA

8. The scope of the GwRA presented herein comprises:

- The use of baseline information from the North Falls Environmental Statement Chapter 19 Ground Conditions and Contamination (July 2024) **[APP-033]** and Appendix 19.1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report (July 2024) **[APP-112]** which this GwRA builds on by utilising more detailed information from sources such as geological memoirs and smaller scale geological mapping to provide a more detailed description of the baseline environment and detailed CSM.
- Completion of a detailed risk assessment of relevant properties to identify those receptors with potential hydraulic connectivity to the Project.
- Recommendations for further monitoring.
- Potential mitigation.

1.4 Sources of Information

9. The baseline information from the North Falls Environmental Statement Chapter 19 Ground Conditions and Contamination (July 2024) **[APP-033]** and Appendix 19.1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report (July 2024) **[APP-112]** has been further developed by utilising additional sources including more detailed desk based information, ground investigation data and reports produced to support the Five Estuaries

Offshore Wind Farm project's (Five Estuaries) groundwater assessments in relation to private water supplies.

10. Four phases of ground investigation have been undertaken, namely, boreholes at Frinton-on-Sea during August 2022 and July 2023 and trial pits at the location of the onshore substation during July 2023 and November 2023.

11. The following information sources have been reviewed to inform the assessment:

1.4.1 Desk Based Baseline Information Revisited for the Purposes of this GwRA

- BGS, England and Wales sheets 224 and 242 Colchester and Brightlingsea Bedrock and Superficial Deposits, 2010, 1:50,000 series.
- BGS, Hydrogeological Map of Southern East Anglia, Including Hydrometric Areas 35 and 36 and parts of 33, 34 and 37, 1981, Scale 1:125,000.
- Multi-Agency Government Information for the Countryside (MAGiC) map applicationhttps://magic.defra.gov.uk/, accessed April 2025.
- BGS Onshore GeoIndex web portal: https://www.bgs.ac.uk/map-viewers/geoindex-onshore/, accessed April 2025.

1.4.2 Additional Desk Based Baseline Information Consulted for the Purposes of this GwRA

- British Geological Society (BGS), England and Wales Sheet 48 SW Colchester Solid and Drift maps, 1876, 1:63,360 old series.
- BGS, England and Wales Sheet 48 SW One Inch Colchester Solid and Drift maps, 1876, 1:63,360 old series.
- BGS, Institute of Geological Sciences, Hydrogeological Map of England and Wales, 1977, Scale 1:625,000.
- BGS, England and Wales sheets 223 Braintree Solid and Drift Edition, 1982, 1:50,000 series.
- BGS Geology of the country around Braintree. Memoir for 1:50 000 geological sheet 223 (England and Wales), 1986.
- BGS Geology of the Woodbridge and Felixstowe district – brief explanation of the geological map Sheets 208 and 225 Woodbridge and Felixstowe, 2002.
- BGS, England and Wales sheets 207 Ipswich Bedrock and Superficial Deposits, 2006, 1:50,000 series.
- BGS Geological Map TM21NW, Solid and Drift, 2012, 1:10,000.
- BGS Geological Map TM22SW, Solid and Drift, 2012, 1:10,000.
- BGS Geological Map TM12SE, Solid and Drift, 2012, 1:10,000.

- BGS Geological Map TM02NE, Solid and Drift, 2012, 1:10,000.
- Cranfield Soil and Agrifood Institute Soilscapes online viewer: https://www.landis.org.uk/soilscapes/indexv1.cfm, accessed April 2025.
- Department for Environment Food & Rural Affairs, Hydrology Data Explorer: Hydrology Data Explorer, accessed April 2025.
- Google Earth Pro, April 2025.
- Met Office Location – Specific long – term averages, accessed online: https://www.metoffice.gov.uk/research/climate/maps-and-data/location-specific-long-term-averages/u10yvptx2, Accessed April 2025.
- National Library of Scotland historical maps, accessed April 2025.

1.4.3 Ground Investigation Information Consulted for the Purposes of this GwRA

- SOCOTEC (August 2022) Five Estuaries, Frinton-on-Sea, Essex. Ground Investigation Report Factual Account of Fieldwork. Monitoring and Laboratory Testing (Report No D3012-22 Issue No 2) (SOCOTEC, 2022).
- SOCOTEC (July 2023) Little Clacton Road, Frinton-on-Sea. Ground Investigation Report Factual Account of Fieldwork. Monitoring and Laboratory Testing (Report No D3012-23 Issue No 1) (SOCOTEC, 2023).
- SOCOTEC (July 2023) Five Estuaries and North Falls Onshore Substations Trial Pits. Ground Investigation Report, Factual Account of Fieldwork and Laboratory Testing (Document Reference D3026-23 Issue No 2) (SOCOTEC, 2023a).
- SOCOTEC (November 2023) Five Estuaries and North Falls Onshore Substations Trial Pits Phase 2. Ground Investigation Report, Factual Account of Fieldwork and Laboratory Testing (Document Reference D3046-23 Issue No 1) (SOCOTEC, 2023b).

1.4.4 Environmental Statement Documents Consulted for the Purposes of this GwRA

- North Falls (July 2024) North Falls Offshore Wind Farm, Environmental Statement Chapter 19 Ground Conditions and Contamination (Document Reference: 3.2.21) **[APP-033]**.
- North Falls (July 2024) North Falls Offshore Wind Farm, Environmental Statement Chapter 19 Figures (Document Reference: 3.2.15) **[APP-064]**.
- North Falls (July 2024) North Falls Offshore Wind Farm, Environmental Statement Appendix 19.1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report (Document Reference: 3.2.20) **[APP-112]**.

1.4.5 Five Estuaries Groundwater Reports Consulted for the Purposes of this GwRA

- SLR Consulting Ltd (February 2025) Five Estuaries Offshore Wind Farm Groundwater Risk Assessment (SLR Project Number: 402.065339.00001.0006.012).
- SLR Consulting Ltd (March 2025) Five Estuaries Offshore Wind Farm Outline Groundwater Monitoring Plan (Document Reference: 10.65).
- Wardell Armstrong (February 2025) Five Estuaries Offshore Wind Farm and North Falls Offshore Wind Farm Onshore Cable Routes – Private Water Supply Monitoring (Document Reference: ED13538.0005.V2.0)

1.5 Limitations

12. The limitations of the assessment presented in this document are provided in Appendix A.

1.6 Report Structure

13. The remainder of this report comprises the following sections:

- Section 2 – Baseline Conditions
- Section 3 – Groundwater Conceptual Site Model
- Section 4 – Preliminary Groundwater Risk Assessment
- Section 5 – Hydrogeological Impact Assessment
- Section 6 – Risk Assessment
- Section 7 – Monitoring and Mitigation
- Section 8 – Summary and Conclusions

2 Baseline Conditions

14. The geological and hydrogeological baseline conditions within the onshore project area are required in order to develop a CSM. This provides a high level overview which will then be refined to provide a localised view for the PWS locations.

2.1 Location

15. The onshore cable route extends for approximately 22 km from the landfall area between Great Holland (National Grid Reference 622732 Easting, 218019 Northing) and east of Ardleigh (National Grid Reference 607258 Easting, 229418 Northing), and comprises land required for the construction and operation of the Project's onshore transmission infrastructure (i.e. landfall, onshore cable route and onshore substation works area).

16. The onshore cable route consists predominantly of agricultural land with several watercourse and road/rail crossings. It is located near towns, villages

and some small woodlands. From the landfall area to the onshore substation works area, the main Parishes crossed are Thorpe-le-Soken, Thorpe Green, Tendring Green, Horsley Cross and Little Bromley. The onshore cable route crosses the A120 road, several B-roads and the train line between Kirby Cross and Thorpe-le-Soken.

2.2 Topography

17. The ground levels at the landfall area begin at sea level rising to 15m Ordnance Datum (OD) within 500m of the landfall area. The route maintains an elevation of between 15m OD and 30m OD up until Tendring Green where elevations rise to 40m OD and then generally remains between 30m OD and 40m OD for the remainder of the onshore cable route. An exception to this is located along a shallow valley, north of Horsley Cross, where the elevation decreases to a minimum of 25m OD.

2.3 Geology

2.3.1 Soils

18. The Cranfield Soil and Agrifood Institute Soilscapes online map viewer data for the onshore project area is shown on Figure 2 and detailed in Table 1.

Table 1 Soil Types Within the Onshore Project Area

Soil Characteristics	Soil Description
Loamy and clayey soils of coastal flats with naturally high groundwater	
Texture	Loamy and clayey
Drainage	Naturally wet
Landcover	Arable, some grassland
Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	
Texture	Loamy and clayey
Drainage	Impeded drainage
Landcover	Grassland and arable, some woodland
Slightly acid loamy and clayey soils with impeded drainage	
Texture	Loamy and clayey
Drainage	Naturally wet
Landcover	Arable, some grassland

2.4 Superficial Geology

19. The superficial geology of the onshore project area (shown on Figure 3) has been collated from BGS datasets, including BGS hydrogeological and geological mapping and historical BGS borehole records. These are

summarised in Table 2. Descriptions of the strata have also been informed by the logs contained within SOCOTEC GI Reports (2022 and July 2023) (borehole locations shown on Figure 5).

Table 2 Superficial Geology Within the Onshore Project Area

Age	Unit Name	Description	Location
Recent	Storm Beach Deposits	Sand, gravel, cobbles and boulders	Located along the south eastern edge of landfall (associated with the beach margin).
	Alluvium	Mainly silty clays with subordinate sand and gravel. Occasional flint, chalk, quartz, shell fragments and organic lenses.	Located throughout the landfall area and at locations within the onshore cable route (associated with surface water features).
Post Glacial	Cover Sands (identified as Cover Sands on Figure 3)	Variable gravelly sandy clay and clayey sand, locally silty and with a sandy upper unit.	Located throughout the onshore cable route, with the exception of between Thorpe Cross and Lodge Lane where it is absent. Located throughout the onshore substation works area.
Glacial	Kesgrave Catchment Sands and Gravels	Sand and gravel with rare lenses of firm gravelly clay.	Located in isolated areas along the onshore cable route.

20. The 1:10,000 BGS geological maps indicate that Brickearth superficial deposits make up the upper part of the cover sands unit comprising of silty clay. This is also shown within the GI logs BHLC-3, BHR-N and BHSR-3, in SOCOTEC GI Report (SOCOTEC 2023) where the Cover Sands gradually gets coarser grained with depth. Head deposits are also recorded within the GI logs in SOCOTEC GI Report (SOCOTEC 2023) and SOCOTEC Onshore Substations Trial Pits report (SOCOTEC 2023b), located stratigraphically above the Cover Sands and London Clay, however Head and Brickearth are not recorded to outcrop on the BGS geological mapping within the onshore project area (shown on Figure 3) and are therefore not included in the table above.

21. Following a review of the BGS boreholes located within 100m of the onshore project area, specifically the onshore substation works area, Glacial deposits described as sands and gravels are recorded below the Cover Sands. The 1:10,000 geological maps indicate that these Glacial deposits are likely to make up the Kesgrave Catchment Sands and Gravels.

2.5 Bedrock Geology

22. The bedrock geology of the onshore project area (shown on Figure 4) has been collated from BGS datasets, including geological mapping and historical BGS borehole records (attached as Appendix B). The bedrock geology underlying site and approximate thickness and depths are recorded in Table

3. Descriptions of the London Clay have also been informed by SOCOTEC GI Report (SOCOTEC 2022) logs and SOCOTEC GI Report (SOCOTEC 2023) logs (borehole locations shown on Figure 5). The approximate depths are derived from the 1:50,000 BGS Geological Cross Section.

Table 3 Bedrock Geology Below the Onshore Project Area

Group	Formation (approximate thickness)	Description	Spatial Location	Approximate Depths (mOD)
Thames Group	London Clay Formation (up to 35m)	Firm to very stiff silty, occasionally sandy clays with occasional gypsum crystals and rare lenses of dark grey silt and rare very weak cream calcareous/ pyrite nodules.	Outcrops/ sub crops below superficial deposits across the landfall, onshore cable route and onshore substation works area.	0 to -35
	Harwich Formation (up to 20m)	Clay, silty with ash layers and cementstone nodules and beds.		
Lambeth Group	Thanet Sand Formation (up to 30m)	Clay, sand and silt with discontinuous thin flint nodule bed at base.	Across the whole onshore project area	15 to -50
Chalk Group	White Chalk Sands and Gravels (up to 225m)	Chalk, soft to hard, with flint-rich and marly flint-free layers and some hard bioclastic chalk beds.	Across the whole onshore project area	-30 to -300
	Grey Chalk Sands and Gravels (up to 45m)	Massively bedded chalk with thin marls becoming more common towards the base.		

23. The BGS Geology of the Woodbridge and Felixstowe District – brief explanation of the Geological Map Sheets 208 and 225 Woodbridge and Felixstowe (2002) records the London Clay as an impermeable layer across the whole onshore project area confining the water within the underlying Chalk principal aquifer. More details of the aquifer characteristics of the underlying strata are detailed in Section 2.4 and 2.7. The shallow Red Crag Formation is also classified as a principal aquifer however this is not recorded within the onshore project area and has therefore not been included in Table 3.

2.6 Hydrogeology

2.6.1 Aquifer Characteristics

24. The superficial aquifer characteristics and bedrock aquifer characteristics along the length of the onshore project area are summarised in Table 4 and Table 5 respectively.

Table 4 Aquifer Characteristics of Superficial Deposits Beneath the Onshore Project Area

Geology	Age	Aquifer Designation	Groundwater Vulnerability
Storm Beach Deposits	Quaternary	Secondary A	N/A
Alluvium		Secondary A	Low
Cover Sands		Secondary B	Unproductive to Medium - Low
Kesgrave Catchment Sands and Gravels		Secondary A	Unproductive to Medium – Low

Table 5 Aquifer Characteristics of the Bedrock Beneath the Onshore Project Area

Geology	Age	Aquifer Designation
Thames Group	Paleogene	Unproductive Aquifer
Thanet Formation & Lambeth Group		Secondary A
White Chalk Sands and Gravels	Upper Cretaceous	Principal Aquifer
Grey Chalk Sands and Gravels		

25. The aquifer classifications detailed in Table 4 and Table 5 are described below:

- Principal Aquifer: These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
- Secondary A Aquifer: These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
- Secondary B Aquifer: These are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
- Unproductive Aquifer: Strata that are largely unable to provide usable water supplies and are unlikely to have surface water and wetlands ecosystems dependent on them.

26. The main aquifers within the onshore project area are:

- Shallow aquifers: The Cover Sands and underlying Kesgrave Catchment Sands and Gravels will form a shallow aquifer below the onshore project area. Where the Cover Sands and underlying Kesgrave Catchment Sands and Gravels outcrop beneath the onshore project area, they will

form a perched aquifer due to the thickness and lateral extent of the London Clay beneath the superficial deposits.

- Chalk aquifer: present at depth beneath the onshore project area, between roughly -30 to -300m OD. Due to the thickness and lateral extent of the Thames Group, there will be no hydraulic continuity between the Chalk aquifer and the superficial deposits. Therefore, the Thames Group clays act as an aquitard between the shallow and deep aquifers and the Chalk aquifer can be scoped out as a potential receptor.

2.7 Source Protection Zones

27. Defra's MAGiC Map website indicates that the majority of the northern half of the onshore project area (from the onshore substation area to northwest of Tendring Green) is located within a Zone III (total catchment) groundwater Source Protection Zone (SPZ). This SPZ is understood to be associated with the underlying Chalk aquifer. The remainder of the onshore project area is not located within an SPZ I (inner) or an SPZ II (outer) zone. The location of groundwater SPZ within the onshore project area is shown in Figure 6.

28. Additionally, localised SPZ I with a 50m buffer would be applied around abstraction points where groundwater is locally abstracted for PWS in accordance with the Environment Agency's approach to groundwater protection (February 2018 version 1.2) document.

2.8 Aquifer Recharge

29. Aquifer recharge along the onshore project area will be variable depending upon the localised superficial geology detailed in Table 2 and Table 4. Cover Sands and the Kesgrave Catchment Sands and Gravels (shown on Figure 3) will likely recharge significantly due to the porous nature of the deposits. Alternatively, the Thames Group is classified as an unproductive aquifer so infiltration rates are likely to be inconsequential relative to run-off acting as an aquitard between the shallow and deep aquifers.

2.9 Recharge Mechanisms

30. The Met Office long-term climate averages for Walton-on-the-Naze (located 20km south-east of the onshore substation area and 5km from the landfall), from the most recent climate period 1991 to 2020 are shown in Table 6 with the highest rainfall average in November and lowest rainfall average in May.

Table 6 Met Office Climate Averages for Walton-on-the-Naze

Month	Maximum Temperature (°C)	Minimum Temperature (°C)	Rainfall (mm)
January	6.98	2.08	48.20
February	7.89	2.62	45.94
March	10.07	3.76	35.26

Month	Maximum Temperature (°C)	Minimum Temperature (°C)	Rainfall (mm)
April	12.11	6.05	33.32
May	15.69	9.07	30.60
June	18.76	11.99	36.91
July	21.53	15.01	48.74
August	21.01	14.61	58.54
September	18.8	12.29	49.38
October	15.01	9.54	54.64
November	10.9	5.81	60.39
December	7.9	2.92	53.86
Average temperature and annual rainfall	**13.92**	**8.01**	**555.78**

2.10 Groundwater Levels

31. Groundwater levels have been assessed based on information provided within SOCOTEC GI Report (SOCOTEC 2022), SOCOTEC Onshore Substations Trial Pits Report (SOCOTEC 2023a), SOCOTEC GI Report (SOCOTEC 2023), SOCOTEC Onshore Substation Trial Pits Phase 2 (SOCOTEC 2023b) and BGS boreholes within 100m of the onshore project area. The exploratory hole locations are shown on Figure 5 and the data is summarised in Table 7 and Table 8.

32. The EA hydrology data viewer provides records of groundwater dip data from Hungerdowns Farm located 210m north of the onshore substation area from 2.00m bgl (35m OD) in April 2024 and decreased to 4.00m bgl (33m OD) in February 2025 shown Figure 1 below. This trend indicates that groundwater

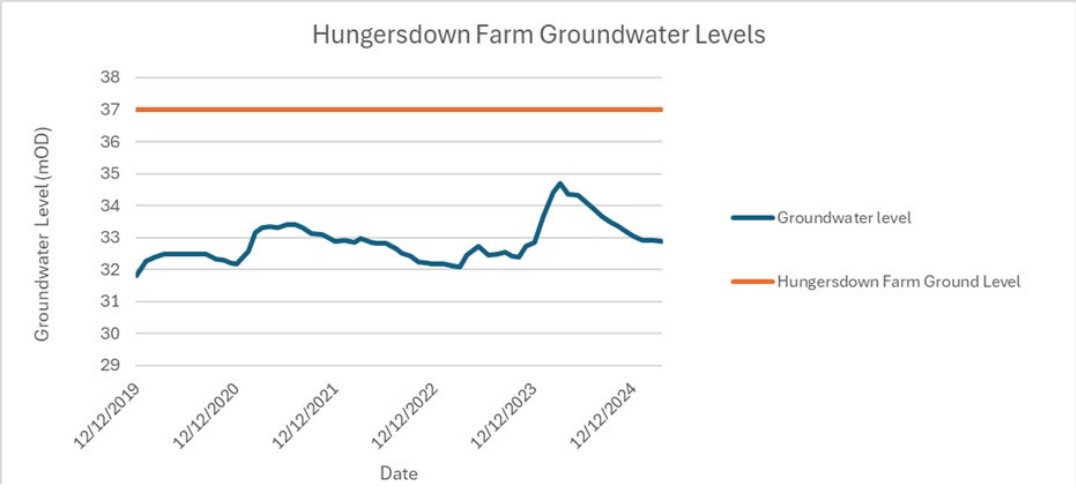

Figure 1 Hungersdown Farm Groundwater Levels

levels are higher following winter (referred to as the winter peak) and steadily decrease throughout the end of the year.

Table 7 Summary of Groundwater Strikes During the Advancement of Exploratory Holes

Location	Struck (m bgl)	Rising To (m bgl)	Struck (m OD)	Rising To (m OD)	Strata the Groundwater was Struck In and then Rested in	Source of Information
Landfall						
BH203	1.20	1.10	-0.29	-0.19	Alluvium	SOCOTEC (2022)
	9.60	6.50	-8.69	-5.59	Alluvium	
Onshore cable route						
BHLC-3	2.00	1.70	23.23	22.93	Cover Sands	SOCOTEC (2023)
BHLC-1	1.10 (Damp)	No rise	22.30	No rise	Made Ground	
BHSR-4	1.20	1.10	26.02	26.12	Made Ground	
	2.00	Slow inflow	25.22	-	Made Ground (top of the Kesgrave Catchment Sands and Gravels)	
TM22SW12	1.20	-	NR	-	Glacial Sand and Gravel*	BGS Borehole
TM22SW13/17	0.90	-	NR	-	Glacial Sand and Gravel*	BGS Borehole
Onshore substation works area						
TP01	2.50	Seepage	32.81	-	Kesgrave Catchment Sands and Gravels	SOCOTEC (2023)
	3.30 (Slow Inflow)	Collapse	32.01	-	Kesgrave Catchment Sands and Gravels	
TP04	2.50	Seepage	32.97	-	Kesgrave Catchment Sands and Gravels	
TP05	2.70	Seepage	32.80	-	Kesgrave Catchment Sands and Gravels	
	3.00	2.90	32.50	32.6	Kesgrave Catchment Sands and Gravels	

Location	Struck (m bgl)	Rising To (m bgl)	Struck (m OD)	Rising To (m OD)	Strata the Groundwater was Struck In and then Rested in	Source of Information
TP07	2.40 (Slow Inflow)	Seepage	32.95	-	Kesgrave Catchment Sands and Gravels	
	2.60	2.40	32.75	32.95	Kesgrave Catchment Sands and Gravels	
TP08	2.50		32.97	-	Kesgrave Catchment Sands and Gravels	
	2.90	Seepage	32.57	-	Kesgrave Catchment Sands and Gravels	
TP10	2.30	Seepage	32.70	-	Kesgrave Catchment Sands and Gravels	
	2.40	2.30	32.60	32.7	Kesgrave Catchment Sands and Gravels	
TP11	2.90	Damp	32.34	-	Kesgrave Catchment Sands and Gravels	
TP12	3.00 (Slow inflow)	2.95	32.50	32.55	Kesgrave Catchment Sands and Gravels	
TP14	2.50	Seepage	32.44	-	Kesgrave Catchment Sands and Gravels	
TP15	3.30 (Slow inflow)	3.25	32.20	32.25	Kesgrave Catchment Sands and Gravels	
TP16	3.00 (Slow inflow)	2.95	32.52	32.57	Kesgrave Catchment Sands and Gravels	
TP17	2.90	Seepage	32.48	-	Kesgrave Catchment Sands and Gravels	
TP19	3.00 (Slow inflow)	2.96	32.64	32.68	Kesgrave Catchment Sands and Gravels	
TP21	2.90 (Slow Inflow)	2.80	32.48	32.58	Kesgrave Catchment Sands and Gravels	

Location	Struck (m bgl)	Rising To (m bgl)	Struck (m OD)	Rising To (m OD)	Strata the Groundwater was Struck In and then Rested in	Source of Information
TP22	2.40 (Slow Inflow)	2.40	32.70	32.70	Kesgrave Catchment Sands and Gravels	
TP25	2.90 (Slow Inflow)	2.70	32.46	32.66	Kesgrave Catchment Sands and Gravels	
TP26	3.00	Seepage	32.32	-	Kesgrave Catchment Sands and Gravels	
TP28	2.50	Seepage	32.72	-	Kesgrave Catchment Sands and Gravels	
TM02NE9	4.00	-	32.00		Glacial Sand and Gravel*	BGS Borehole
TM02NE8	6.10	-	30.80	-	Glacial Sand and Gravel*	BGS Borehole
TM02NE14	2.80	-	32.60	-	Glacial Sand and Gravel*	BGS Borehole
TM02NE15	2.70	-	31.70	-	Glacial Sand and Gravel*	BGS Borehole
Note: "- " indicates that during the advancement of the boreholes they were not left for 20 minutes as is standard practice to measure the rise. "NR" not recorded						

*likely to be the Kesgrave Catchment Sands and Gravels.

Table 8 Summary of Groundwater Monitoring

Location	Installation Depth	Stratum Installed into	Groundwater Monitored Depth Min (m bgl)	Groundwater Monitored Depth Max (m bgl)	Groundwater Monitored Level Min (m OD)	Groundwater Monitored Level Max (m OD)	Stratum Monitored in	Source of Information
Landfall								
BH203	11.00 – 22.20	London Clay	0.17	1.56	0.74	-0.65	Alluvium	SOCOTEC (2022)
BH202	9.00 – 19.50	London Clay	0.97	1.07	0.17	0.07	Topsoil	
BH201A	13.00 – 22.00	London Clay	0.60	0.70	0.37	0.27	Alluvium	
Onshore cable route								
BHR-N (1)	4.50 – 25.00	London Clay	2.04	17.74	5.51	20.94	Possible Cover Sands and the London Clay	SOCOTEC (2023)
BHR-S (1)	5.00 – 25.45	London Clay	18.57	21.37	-5.71	-2.87	London Clay	
BHRSR-4 (1)	5.00 – 20.00	London Clay	10.40	14.06	13.16	16.82	London Clay	

2.10.1 Groundwater Levels Within the Cover Sands

33. The SOCOTEC GI Report (SOCOTEC 2023a), records one groundwater strike within the Cover Sands at 2.00m bgl (23.23m OD) rising to 1.70m bgl (22.93m OD). During the post GI groundwater monitoring levels were recorded at 2.04m bgl (20.94m OD) within the Cover Sands on two occasions and at 17.74 bgl (5.51m OD) within the London Clay.

34. Hungerdowns Farm BGS borehole (TM02NE8, provided in Appendix C) shows that the groundwater is recorded within the Cover Sands superficial deposits, just above the glacial sand and gravel (interpreted as the Kesgrave Catchment Sands and Gravels). Based on the Hungersdown data from the past 5 years, the groundwater level data tends to fluctuate on a yearly basis with a range of between 0.50m to 2.00m per year (shown on Figure 1). The average standing groundwater depth was recorded at 4.00m bgl (33.00m OD) and the deepest groundwater level was recorded at 5.18m bgl (31.82m OD) in December 2019, and the shallowest groundwater was recorded at 2.29m bgl (34.71m OD) March 2024. The EA dip data could also indicate that the borehole is quick to recharge on a yearly basis, following the winter peak.

2.10.2 Groundwater Levels Within the Kesgrave Catchment Sands and Gravels

35. The SOCOTEC Onshore Substations Trial Pits Report (SOCOTEC 2023a) and SOCOTEC Trial Pits Phase 2 GI Report (SOCOTEC 2023b) records trial pits (TP) undertaken between May 2023 to October 2023 within the onshore substation area (TP locations shown on Figure 5). All the TPs indicate groundwater seepages within the Kesgrave Catchment Sands and Gravels from 2.30m bgl (33.00m OD) and 3.30m bgl (32.00m OD). As the GI was completed in mid-May and mid-October it is anticipated that winter peak water levels will potentially be higher.

2.10.3 Groundwater Levels Within the London Clay

36. During the post GI groundwater monitoring within SOCOTEC GI Report (SOCOTEC 2023a), the groundwater levels were predominantly recorded within the London Clay from 10.40m bgl (16.82m OD) to 21.37m bgl (-5.71m OD). There is a lot of variability in the head of water across the boreholes e.g. in BHR-N groundwater levels were dipped at 2.04m bgl and then 17.74m bgl. This would suggest that something is influencing the groundwater level or that there is inconsistency in the results.

37. During the GI groundwater levels from installations within the London Clay were recorded at near sea level indicating that it is sub artesian at depths of between 0.17 – 1.07m bgl (-0.65m OD to 0.74m OD) during the post GI groundwater monitoring.

2.11 Groundwater Flow

38. Due to the potentially tidally influenced groundwater level, particularly in the landfall area, the groundwater flow is considered to be towards the North Sea

located immediately southeast of the landfall. Additionally, groundwater flow within the superficial deposits, across the onshore project area, will largely follow the local topography and potentially be influenced by any watercourses present along the route. Based on the OS historical mapping Kirby Brook, Holland Brook and Tendring Brook all have water flowing in the south / south east direction generally flowing towards Hamford Water and the North Sea.

2.12 Springs

39. A review of historical OS mapping available from the National Library of Scotland has identified a spring located 125m southwest of the onshore project area, north of Thorpe-Le-Soken. The closest borehole to the spring indicates that the London Clays are located at / close to the surface in this area at the junction between the superficial deposits and the underlying London Clay suggesting that these could potentially be fed by an element of spring flow. However, given that springs are not recorded in the onshore project area these are not likely to be significant features.

2.13 Aquifer Parameters

2.13.1 Hydraulic Conductivity

40. During the SOCOTEC GI (SOCOTEC 2022; SOCOTEC 2023) in situ permeability tests were undertaken within the exploratory boreholes; one within the Made Ground, one within the Cover Sands, one within possible Alluvium, one within Kesgrave Catchment Sands and Gravels and four within the London Clay. For one of the locations there is no log to understand what stratum was tested. The tests did not appear to perform well and although the results are indicative of the potential hydraulic conductivity of the London Clay, the Kesgrave Catchment Sands and Gravels is far lower than what would be expected. In order to be conservative, values of hydraulic conductivity have been calculated using the geotechnical test results.

41. A review of the Particle Size Distribution (PSD) analysis completed as part of the SOCOTEC GI report (SOCOTEC 2022), SOCOTEC GI report (SOCOTEC 2023), SOCOTEC Trial Pits GI (SOCOTEC 2023a) and SOCOTEC Trial Pits Phase 2 GI (SOCOTEC 2023b) has been done to calculate the hydraulic conductivity of the Cover Sands and the Kesgrave Catchment Sands and Gravels. The data close to the saturate level of the deposits, stratigraphically above the London Clay, has been used for the analysis below. The Beyer formula (Equation 1) has been used to assess the hydraulic conductivity.

Equation 1 Beyer Formula

$$k_H = C_B \frac{g}{v} In \left(\frac{500}{\frac{D_{60}}{D_{10}}} \right) D_{10}^2$$

k_H = hydraulic conductivity (m/sec)

C_B = empirical coefficient equal to $6x10^{-4}$

g = gravitational acceleration ($9.8m/sec^2$)

v = kinematic viscosity of water ($1.2e\text{-}6m^2/sec$)

D_{10} = grain diameter for which 10% passes the sieves (mm)

D_{60} = grain diameter for which 60% passes the sieves (mm)

42. An estimate of the hydraulic conductivity of superficial deposits located across the onshore project area, including Kesgrave Catchment Sands and Gravels, the Cover Sands and Alluvium deposits is summarised in Table 9, which suggests the hydraulic conductivity of the superficial deposits vary from $7.09x10^{-4}$ to $2.95x10^{-3}$m/sec. The calculated hydraulic conductivity is typical of granular gravel and sand mixtures with good drainage.

Table 9 Hydraulic Conductivity of Superficial Deposits Within the Onshore Project area

Exploratory Hole ID	Sample Depth	D10 (mm)	D60 (mm)	Stratum	Hydraulic Conductivity (m/sec)
Landfall area					
BH203	10.00 - 10.10	0.200	16.000	Alluvium	N/A*
Onshore cable route					
BHLC-1	2.50 – 3.00	0.256	5.310	Kesgrave Catchment Sands and Gravels	$7.83x10^{-4}$
BHLC-3	3.20 – 3.70	0.256	1.720		$1.06x10^{-3}$
BHSR-3	2.00	0.300	2.000	Cover Sands	$1.46x10^{-3}$
Onshore substation works area					
TP01	3.00 - 3.10	0.170	0.570	Kesgrave Catchment Sands and Gravels	$7.09x10^{-4}$
TP04	2.00 – 2.20	0.310	3.000		$1.86x10^{-3}$
TP05	2.90 – 3.00	0.371	2.337		$2.95x10^{-3}$
TP08	2.80 – 2.90	0.168	0.383		$7.45x10^{-4}$
TP10	2.00 – 2.20	0.327	1.122		$2.61x10^{-3}$
TP11	2.00 – 2.10	0.300	6.300		N/A*
TP16	2.00 – 2.20	0.181	1.000		$7.23x10^{-4}$
TP19	2.90 – 3.00	0.312	4.060		$1.74x10^{-3}$
TP22	2.00 – 2.20	0.300	1.875		$1.93x10^{-3}$
TP28	2.00 – 2.20	0.187	0.521		$8.89x10^{-4}$

Exploratory Hole ID	Sample Depth	D10 (mm)	D60 (mm)	Stratum	Hydraulic Conductivity (m/sec)
Note * Formula only appropriate where D10 between 0.06mm and 0.6mm and D10 <6.0mm					

43. For this report, the Beyer formula is used to estimate permeability based on laboratory testing results and therefore might not be reflective of the in situ hydraulic conductivity which would vary across spatial distance and strata proportions. If an abstraction licence is ultimately required for dewatering (abstracting at least 20m^3 per day as part of a single operation), a more rigorous approach, such as completion of a pump test, would be undertaken to allow for more accurate assessment of dewatering volumes and potential impact.

2.14 Radius of Influence

44. Based on the range of permeabilities for the granular Cover Sands and Kesgrave Catchment Sands and Gravels of 7.09 x 10^{-4} m/sec to 2.95 x 10^{-3} m/sec from the above PSD analysis shown in Table 9 and a drawdown of up to 1.50m (based on a maximum excavation depth of 2.00m and minimum winter water level of 0.50m bgl a worst-case radius of influence can be ascertained based using the Sichardt formula (Equation 2), whereby:

Equation 2 Sichardt Formula

$$R_0 = Cs\sqrt{k}$$

R_0 = radium of influence (m)

C = empirical factor (3000)

s = drawdown (m)

k = hydraulic conductivity (m/sec)

45. The radius of influence assessment, based on a drawdown of 1m and 1.5m, would result in a radius of influence of between 80m (using the minimum assumed drawdown and hydraulic conductivity of 7.09 x 10^{-4} m/sec) and 244m (using the maximum assumed drawdown and hydraulic conductivity of 2.95 x 10^{-3} m/sec). Therefore, as a worst-case the assessment buffers around the PWS abstraction points (shown on Figure 7) has been set at 250m. This conservative approach allows for the potentially fast travel times for any pollution incidents to impact PWS abstraction points.

46. Limitations and uncertainties with the use of the Sichardt formula (Equation 2) have been considered, including uncertainties of the empirical calibrations factor 'C' origin, however it is understood that this typically results in a conservative estimate of the radius of influence and it is a good rule of thumb

to estimate a radial drawdown. Therefore, the radius of influence has been extended up to 250m to allow for this inherent uncertainty.

47. This conservative calculation is supported by the radius of downdrawn table presented in the Handbook of Geotechnical Investigation and Design Tables, (Burt Look, 2007) which references "Control of Groundwater for temporary works'' CIRIA Report 113 (Somerville S.H,1986). The table indicates that for a drawn down of 1 – 2m in clean sand and gravel mixtures to clean gravels the radius of influence would be between 30 and 190m.

48. As previously indicated pump tests could be considered following further survey work and once the detailed design is undertaken to confirm the actual physical draw down radius of dewatering activities along the onshore cable route. These pump tests will also provide further information in relation to the protection of private potable water supply.

2.15 Groundwater Quality

49. The EA water quality archive indicates that one groundwater quality monitoring point is located within 250m of the onshore project area, located at Welhams Farm. This monitoring point corresponds with RH26 detailed in Table 11, which likely monitors groundwater within the chalk aquifer. The monitoring data indicates elevated chloride, sodium, fluoride and some heavy metals which are considered to be reflective of saline influences on the Chalk aquifer.

50. BGS Borehole TM12NW13/B, located 135m southwest of the onshore project area (as shown on Figure 5), recorded groundwater at 34.00m bgl (2.00m OD) within the London Clay. Groundwater testing has been undertaken within this borehole and it was found that the water recorded salt levels too high for domestic use.

2.16 Hydrology

51. The onshore project area intercepts with multiple minor watercourses and drains predominantly located along field boundaries. The following named surface water features are located along the onshore project area:

- Kirby Brook located within the landfall area.
- Holland Brook located within the landfall area and onshore cable route.
- Tendring Brook located within the onshore cable route.

52. Water Environment Regulations 2017 (WER) surface water body catchments within the onshore project area are summarised in Table 10.

Table 10 Details of the Surface Water Features Within the Onshore Project Area

Feature	Details
WER surface water body catchments (Ecological and WER classification	Name: Holland Brook; Waterbody ID: GB105037077810; Chemical classification: Fail (2019) due to concentrations of mercury (and its compounds) and polybrominated diphenyls ethers (PBDE); Location: Present at landfall, throughout the onshore cable route and north eastern part of the onshore substation area.

Feature	Details
2022 all Moderate unless otherwise stated).	Name: Wrabness Brook; Waterbody ID: GB105036040800; Chemical classification: Fail (2019) due to concentrations of mercury (and its compounds) and PBDE; Ecological and WER classification: Good; Location: Present as an isolated area of the onshore cable route north of Harwich Road along the onshore cable route.
	Name: Tenpenny Brook; Waterbody ID: GB105037041310; Chemical classification: Fail (2019) due to concentrations of mercury (and its compounds) and PBDE; Location: Present within the onshore cable route west of Paynes Lane to Ardleigh Road and throughout the onshore substation area.
WER surface water bodies	Name: Holland Brook; Waterbody ID: GB105037077810; Type: River; Chemical classification: Fail (2019) due to concentrations of mercury (and its compounds) and PBDE; Ecological and WER classification: Moderate. Location: Crosses the onshore cable route running north to south.

2.17 Ecological Sites

53. The Defra MAGiC Map indicates that the landfall area is located within Holland Haven Marshes Site of Special Scientific Interest (SSSI) and Holland Haven Local Nature Reserve (LNR). The SSSI is designated for its mixture of estuarine saltmarsh and freshwater marsh and grasslands, including an area of amenity grassland on Frinton golf course. The SSSI is entirely underlain by alluvium with limited groundwater. The marshes are likely to be fed by surface run-off associated with poor drainage from the alluvium and cover sands superficial deposits.

54. The Holland Brook is designated as a Nitrate Vulnerable Zone (NVZ). This is likely to be related to agricultural activities within its vicinity.

3 Groundwater Conceptual Site Model

3.1 Aquifer Potential

3.1.1 Superficial Deposits

55. The assessment of the baseline conditions indicates that the onshore cable route and onshore substation area is underlain by aquifers within the Cover Sand and the Kesgrave Catchment Sands and Gravels superficial deposits which vary in thickness from 1.00m to 16.00m (refer to Appendix B for further details). Storm beach deposits are only recorded along the southeast border of the landfall, associated with the inland beach margin so are not considered a significant underlying aquifer.

56. Alluvium is generally located below watercourses and has a low groundwater vulnerability due to its low permeability. Based on the GI data the alluvium below the onshore project area, in particular at the landfall area, varied in thickness from 5.00m to 11.00m.

57. Based on BGS boreholes within 100m of the onshore project area (locations shown on Figure 5 and BGS borehole logs provided as Appendix C) Glacial deposits comprising of sands and gravels were recorded in the vicinity of the onshore substation works area with a thickness from 3.40m to 8.00m (refer to Appendix B). The 1:10,000 geological maps indicate that these Glacial Deposits make up the Kesgrave Catchment Sands and Gravels.

3.1.2 Bedrock

58. The Thames Group is considered an unproductive aquifer based on the BGS Geological Memoir and outcrops beneath 40.6% of the onshore project area. Stratigraphically the upper unit of the Thames Group, the London Clay Formation, is underlying the superficial deposits across the whole onshore project area (shown on Figure 4) with a thickness, based on the GI, of up to >21.80m and >30.00m (refer to Appendix B for more details). Due to this the London Clay formation is considered an aquitard providing no hydraulic continuity between the superficial deposits and the principal Chalk aquifer beneath.

59. The proposed works will comprise of either a shallow trenched onshore cable route installation works (up to 2.00m deep) or trenchless cable installation, such as Horizontal Directional Drill (HDD) which could potentially extend up to 20.00m bgl. The areas where trenchless techniques will be used are shown on Figure 1 and Figure 7. Due to the thickness of the Thames Group, it is considered that there is no feasible potential for the activity to extend beyond its base. Therefore, the Chalk aquifer has been excluded as a potential receptor from the proposed onshore cable route works. The foundation arrangements for the onshore substation are presently not known, however, given that groundwater is not abstracted from the chalk within its vicinity the Chalk aquifer at this location has additionally been excluded.

3.1.3 Groundwater and Surface Water Levels

60. Groundwater was generally recorded in the Kesgrave Catchment Sands and Gravels or the Cover Sands superficial deposits and the boreholes became dry when intercepting the London Clay suggesting the water may be perched on top of the London Clay.

61. GI and post GI groundwater monitoring data indicates that the groundwater level is generally recorded within the Cover Sands and Kesgrave Catchment Sands and Gravels from 1.70m bgl (24.62m OD) to 5.18m bgl (31.82m OD).

62. Due to this variation, it is unlikely the groundwater levels are in continuity with surface water features and their headwaters. Additionally superficial deposits are largely absent beneath the Holland Brook and Tendring Brook and its tributaries, which are largely underlain directly by the London Clays or Alluvium (shown on Figures 3 and 4). Therefore, licenced surface water abstractions along these watercourses have been scoped out of further assessment.

3.1.4 Groundwater Abstractions and Dewatering

63. To assess the potential radius of influence for any dewatering required for the onshore cable route installation works, the baseline information has been used and a conservative search buffer of 250m has been calculated and used within the assessment (shown around PWS abstraction points on Figure 7). Details of local abstractions are provided in Section 4. A total of 33 groundwater abstractions have been identified within 250m of the onshore project area (shown on Figure 7). Six groundwater abstractions are recorded as non-potable and are related to irrigation and 27 groundwater abstractions are recorded as potable. Nine PWS have been included >250m from the onshore project area, due to uncertainty in some of their locations. This is refined as the assessment is progressed.

64. It is acknowledged that trenchless techniques, such as HDD, are proposed at a number of locations where open trenching is not viable (shown on Figure 1 and 7), this may extend to depths up to 20.00m bgl, however based on the baseline assessment it is assumed that these works do not require extended periods of dewatering. There will be some displacement or removal of water associated with the use of drilling fluids during this process. However, given the limited dewatering which would occur, it is considered that the 250m radius for assessment is applicable for the drilling locations.

65. Any contamination risk would be limited to drilling fluids used within the process entering the aquifer system in the immediate vicinity of the drilling for which a 250m radius is a conservative assessment parameter.

4 Preliminary Groundwater Risk Assessment

4.1 Groundwater Abstractions

66. The locations of the PWS were obtained from the following sources:

- EA and Essex County Council (Local Authority (LA)) through a freedom of information request as detailed in Appendix 19.1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report (July 2024) **[APP-112]**
- Environmental Database Report obtained to complete Appendix 19.1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report (July 2024) **[APP-112]**
- The July / August 2024 survey recorded within the Private Water Supply Monitoring Report (Wardell Armstrong (WA), February 2025).
- Observations made by the Project's land agent during site visits.

67. A summary of the PWS and licenced abstractions within 250m of the onshore project area is presented as Table 11. Abstractions located slightly >250m, near areas where confirmed onshore cable route installation works, including dewatering activities, may occur, have also been included in the assessment to ensure a conservative approach. It should be noted that the exact positioning of the trenchless crossings have not been confirmed and therefore

it has been assumed that dewatering is likely in the positions shown on Figure 7.

Table 11 Summary of Private Water Supplies Within 250m or Vicinity of the Onshore Project Area Preliminary Assessment

RHDHV Reference	Source of Information	Abstraction Type	Location	Distance from Onshore Project Area	Feature Measured To	Other Relevant Information	Figure Reference
RH01	EA	Potable Supply	Dedham Vale Farms, Badley Hall, Ardleigh, CO7 7NF	105m	EACN	8/37/25/*G/0064. General agriculture – general farming and domestic. It is not clear if these are three separate abstraction points or one whereby different coordinates have been supplied during the permit application process.	Figure 7h
RH02				15m			
RH03				170m			
RH04		Non Potable Supply		200 to 215m		8/37/25/*G/0191. General agriculture – spray irrigation (direct). Abstracted from Glacial Sands and Gravels.	
RH05	EA	Non Potable Supply	Tabor Farms Limited, Sutton Hall Farm, CO11 2QF	165m to 210m		8/37/25/*G/0236. Range in distance due to two abstraction coordinates being provided.	
RH06	EA	Non Potable Supply	T & R Fairley Farms Partnership, Abbotts Hall, Mistley, CO11 2NX	50m to 55m	Construction / Access Road	8/37/25/*G/0172. General agriculture – spray irrigation. Abstracted from Glacial Sands and Gravels. Range in distance due to two abstraction coordinates being provided.	
RH07	Land Agent	Unregulated Non Potable Supply	Normans Farm, Ardleigh Road, Little Bromley, Manningtree, CO11 2QB	10m	Construction / Access Road	Well and Mains. Used for Irrigation assume that other supplies other than kitchen tap are well fed at this location. UV filter used for water treatment.	
RH08	LA	Regulation 10 Potable Supply (SD)	Mulberry Lodge, Ardleigh Road Manningtree, CO11 2QB	290m	Construction / Access Road	Domestic supply.	

RHDHV Reference	Source of Information	Abstraction Type	Location	Distance from Onshore Project Area	Feature Measured To	Other Relevant Information	Figure Reference
RH09	LA	Regulation 10 Potable Supply (SD)	Jennings Farm House, Ardleigh Road Manningtree, CO11 2QB	330m	Construction / Access Road	Domestic supply. UV mechanical filter used for water treatment (for drinking water only).	
RH10	LA	Regulation 10 Potable Supply (SD)	The Coach House Manningtree, CO11 2PP	185m	Construction / Access Road	Domestic supply.	
RH11a	LA	Regulation 10 Potable Supply (SD)	Little Bromley Hall Manningtree, CO11 2PP	205m	Construction / Access Road	Domestic supply. UV, nitrate filter and particle filter used for water treatment and is only used in emergencies.	
RH11b	WA	Assumed potable (SD)	Little Bromley Hall Manningtree, CO11 2PP	320m	Construction / Access Road	Assumed domestic supply. UV, nitrate filter and particle filter used for water treatment.	
RH12	LA	Regulation 10 Potable Supply (SD)	The Old Rectory, Manningtree, CO11 2PP	265m	OCR	Domestic supply. UV filter used for water treatment.	Figure 7g
RH13	LA	Regulation 10 Potable Supply	Barlon House, Little Bromley Road, Manningtree, CO11 2PP	300m	Construction / Access Road	Domestic supply.	
RH14	Land Agent	Unregulated Potable Supply	Hiskleys Farm Kennels, Spratts Lane, Manningtree, CO11 2PR	150m		Domestic supply although is also on the mains.	
RH15	Unregulated Land Agent	Potable Supply	Triangle Farm, Spratts Lane,	325m	OCR	Assumed domestic supply.	

RHDHV Reference	Source of Information	Abstraction Type	Location	Distance from Onshore Project Area	Feature Measured To	Other Relevant Information	Figure Reference
			Manningtree, CO11 2PR				
RH16	LA	Regulation 10 Potable Supply	Woodside, Spratts Lane, Manningtree, CO11 2PR	325m		Domestic supply.	
RH17	LA	Regulation 10 Potable Supply	Paynes Cottage, Payne's Ln, Little Bromley, Manningtree CO11 2PJ	20m	Construction / Access Road	Domestic supply. UV mechanical filter used for water treatment.	
RH18	Land Agent	Unregulated Potable Supply (SD)	Richmond Cottage, Paynes Lane, Little Bromley, CO11 2PJ	120m		Well and mains.	
RH19	LA	Regulation 10 Potable Supply (SD)	Crabtrees, Paynes Lane, Little Bromley, CO11 2PJ	150m	Construction / Access Road	Domestic supply. UV filter used for water treatment.	
RH20a	LA	Regulation 10 Potable Supply (SD)	Mulleys Farm, Bentley Rd, Manningtree CO11 2PL	255m		Domestic supply. UV filter used for water treatment.	
RH20b	WA	Assumed Potable	Mulleys Farm, Bentley Rd, Manningtree CO11 2PL	285m		Assumed domestic supply. UV filter used for water treatment.	

RHDHV Reference	Source of Information	Abstraction Type	Location	Distance from Onshore Project Area	Feature Measured To	Other Relevant Information	Figure Reference
RH21 (SD)	LA	Regulation 10 Potable Supply	Mulleys Cottage, Bentley Rd, Manningtree CO11 2PL	305m	Construction / Access Road	Domestic supply. UV filter used for water treatment.	
RH22 (SD)	LA	Regulation 10 Potable Supply	Grove Cottage, Bentley Rd, Manningtree CO11 2PL	325m		Domestic supply.	
RH23	LA	Regulation 9 Potable Supply	The Haywain Commercial Premises, Bentley Rd, Manningtree CO11 2PL	355m		Commercial supply	
RH24	LA	Regulation 10 Potable Supply*	Oakwood, Bentley Road, Little Bentley, Colchester CO7 8SS	35m		Domestic supply. Reported that it is not used for drinking water.	
RH25	LA	Regulation 10 Potable Supply	Orchard Cottage, Bentley Road, Little Bentley, Colchester CO7 8SS	10m		Domestic supply.	
RH26	LA	Regulation 10 Potable Supply	Craigus and Welhams Farm, Bentley Rd, Colchester CO7 8SS	50m		Domestic supply.	

RHDHV Reference	Source of Information	Abstraction Type	Location	Distance from Onshore Project Area	Feature Measured To	Other Relevant Information	Figure Reference
RH27	EA	Non Potable Supply	John Jiggens Limited, Hempstalls Farm, Horsley Cross, Manningtree CO11 2NZ	30m		8/36/19/*G/0092. General agriculture – spray irrigation.	Figure 7a to 6f
RH28	LA	Regulation 10 Potable Supply	Dypaca, Thorpe-le-Soken, Clacton-on-Sea CO16 0LE	215m	Construction / Access Road	Domestic supply.	
RH29	LA	Regulation 10 Potable Supply	Thorpe Park Farm, Thorpe Park House, 1 - 5 Thorpe Park Cottages, Clacton-on-Sea CO16 0HN	150m	Construction / Access Road	Domestic supply.	
RH30a	EA	Non Potable Supply	A H Brown Farms Dairy House Farm, Frinton-on-Sea, CO13 0EX	0m		8/37/26/*G/0091, General agriculture - spray irrigation	
RH30b	WA	Assumed Non Potable Supply	A H Brown Farms Dairy House Farm, Frinton-on-Sea, CO13 0EX	80m	OCR and TC	Assumed general agriculture - spray irrigation	
Note: * Recorded as a Regulation 10 Potable Supply within the LA records however it was identified during the WA July/ August 2024 survey that RH24 is not used for drinking water and therefore further information needs to be obtained from the landowner/ tenant to confirm this.							

EACN – East Anglia Connection Node, OSWA – Onshore Substation Works Area, OCR – Onshore Cable Route and TC - Trenchless Crossing

68. The PWS and licenced abstractions within 250m of the onshore project area or within the vicinity of an area with proposed trenchless crossings are shown on Figure 7.

4.2 Site Walkover and Preliminary Survey

69. As part of the Five Estuaries Offshore Wind Farm Groundwater Risk Assessment (SLR Consulting Ltd, February 2025) a PWS survey was undertaken by Wardell Armstrong between 31st July and 1st August 2024 which included water level monitoring of abstraction wells RH07, RH08, RH10, RH11, RH12, RH17, RH20, RH24 and RH26 (shown on Figure 7) in order to characterise the aquifer contributing groundwater to the PWS abstractions. The monitored PWS groundwater details are summarised in Table 12.

70. The abstraction locations have been numbered differently across this report, the Wardell Armstrong Report and the SLR Report, Table 12 brings all this information together so it is clear which PWS and licenced abstractions are at which location.

71. It should be noted that Wardell Armstrong were told verbally by the landowner that the borehole at Welhams Farm (RH26) is 91.40m deep indicating that the borehole abstracts groundwater from the Chalk Aquifer.

72. Additionally, a survey was undertaken on RH30 located at A H Brown Farms Dairy House and it has been reported that abstraction point RH30 closest to the onshore project area has been capped and is currently not in use. Therefore, these points have been relabeled as RH30a and RH30b (shown on Figure 7) to distinguish between the two and RH30a closest to the onshore project area has been scoped out of the assessment. It has been confirmed by the owner that RH30b is intermittently used for agricultural purposes only.

73. During the Wardell Armstrong PWS monitoring another abstraction well with address Little Bromley Hall (RH11a) was identified and has therefore been included in this assessment (shown on Figure 7 as RH11b).

74. RH20 has been identified by Wardell Armstrong as multiple coordinates from the same abstraction address (Mulleys Farm). Additionally, the Wardell Armstrong monitoring report indicates that WA 005 and 006 are abstractions from two different wells (005 accessed through wooded area from the front car park 006 located adjacent to the farm track). Therefore 005 and 006 have been added as RH20a and RH20b on Figure 7.

75. It should be noted that SLR incorrectly interpreted RH09 (Jennings Farm) as Mulberry Lodge. Additionally, RH21 (Mulleys Cottage) was monitored during the WA PWS monitoring, however, is not located within 250m of the onshore project area and can therefore be scoped out of the assessment.

Table 12 Private Water Supply Details Including Abstraction Points Identified during the July/ August 2024 Wardell Armstrong Survey and the SLR survey undertaken in December 2024.

RH ID	SLR ID	SLR Address	WA Mapping ID	WA Address	Type	Depth to Water (m bgl)	Depth to Base (m bgl)	Internal Diameter (m)	Assumed Groundwater Source
RH17 (Paynes Cottage)	SLR001	Paynes Cottage	001	Paynes Cottage	Well	1.40	3.06	1.40	Superficial
RH11a (Little Bromley Hall)	SLR002	Little Bromley Hall	002*	Little Bromley Hall	Well	3.44	5.94	1.20	Superficial
RH11b (Little Bromley Hall)	SLR003	N/A	003	little Bromley Hall	Well	2.36	4.80	1.20	Superficial
RH10 (The Coach House)	SLR004	The Coach House	004*	Outside the Coach House	Well	2.63	4.70	1.60	Superficial
RH20a (Mulleys Farm)	SLR006	Mulleys Farm	005	Mulleys Farm	Well	1.85	2.65	0.60	Superficial
RH20b (Mulleys Farm)		Mulleys Farm	006	Mulleys Farm	Well	1.45	2.70	0.65 x 0.40	Superficial
RH09 (Jennings Farm)	SLR007	Mulberry Lodge	007	Jennings Farm	Well	1.79	4.00	1.50	Superficial
RH07 (Normans Farm)	SLR008	Normans Farm	008*	Normans Farm	Well	1.40	3.30	0.62 x 0.46	Superficial
RH19 (Crabtrees)	SLR009	Crabtrees	009	Crabtrees	Well	2.14	3.88	0.60 x 0.40	Superficial
RH26 (Welhams Farm)	SLR010	Welhams Farm	010*	Welhams Farm	Borehole	-	~91.40	-	Chalk
RH24 (Oakwood)	SLR011	Oakwood	011*	Oakwood	Well	1.45	3.28	1.15	Superficial
RH21 (Mulleys Cottage)	N/A	Mulleys Cottage	012*	Mulleys Cottage	-	1.20	-	-	-

RH ID	SLR ID	SLR Address	WA Mapping ID	WA Address	Type	Depth to Water (m bgl)	Depth to Base (m bgl)	Internal Diameter (m)	Assumed Groundwater Source
RH12 (The Old Rectory)	SLR012	The Old Rectory	013*	The Old Rectory	Borehole	0.66	5.80	-	Superficial
RH25 (Orchard Cottage)	SLR014	Orchard Cottage	N/A	-	-	-	-	-	-
RH14 (Hiskeys Farm)	SLR015	Hiskeys Farm	N/A	-	-	-	-	-	-
RH18 (Richmond Cottage)	SLR016	Richmond Cottage	N/A	-	-	-	-	-	-
RH30b (A H Brown Farms Dairy House)	A10	A H Brown Farms Dairy House	N/A	-	Well	3.00 to 10.00	10.00	-	Superficial

* Wardell Armstrong abstraction locations that have been adjusted by Wardell Armstrong based on aerial imagery.

In our assessment the RH ID has been utilised.

The Wardell Armstrong and SLR reports use different references across their reports for instance The Old Rectory is indicated to be 013 and in another report is 012. The numbering in this table is the ones given in the latest supplied reports.

- Data unknown

4.2.1 Groundwater Monitoring

76. The SLR Private Water Supply Monitoring Report (February 2025) recorded relatively shallow groundwater within the superficial deposits between 1.45m bgl and 3.44m bgl, with an average water level of 1.80m bgl.

4.3 Refined Private Water Supply Assessment

77. The refined PWS and the licenced abstractions assessment detailed in Table 13 considers the distance of the private water abstraction from the onshore project area, areas of proposed trenchless crossings and what construction activities are taking place within the vicinity of the abstraction in order to determine which abstractions are carried through to the next stage of assessment. Those abstractions carried through have been considered further within the hydrogeological impact assessment in Section 5.

78. Distances from the abstraction points to the Project have been refined and confirmed following the Wardell Armstrong site visits which confirms those previously included within Table 11 in excess of 250m are no longer identified as being at risk.

Table 13 Refined Private Water Supplies Assessment

RHDHV Reference	Location	Property Carried Through to Refined Assessment	Distance from the Onshore Cable Route, Onshore Substation, EACN or Access Road (direction)	Property Removed from Further Assessment and Reasoning
RH01	Dedham Vale Farms, Badley Hall, Ardleigh, CO7 7NF	No	105m (west)	Within the vicinity of the East Anglia Connection Node (EACN), onshore substation area and it is >250m from confirmed OCR construction activity where dewatering may occur.
RH02			15m (west)	
RH03			170m (west)	
RH04			200 to 215m (west)	
RH05	Tabor Farms Limited, Sutton Hall Farm, CO11 2QF	No	165m to 210m (north)	
RH06	T & R Fairley Farms Partnership, Abbotts Hall, Mistley, CO11 2NX	No	50m to 55m (south)	South of the OSWA access road and it is >250m from confirmed OCR construction activity where dewatering may occur.
RH07	Normans Farm, Ardleigh Road, Little Bromley, Manningtree, CO11 2QB	Yes	10m (north) from the Construction / Access Road and 60m (east) from OCR / TC	-
RH08 (SD)	Mulberry Lodge, Ardleigh Road Manningtree, CO11 2QB	No	290m (northeast)	Northeast of the onshore project area, it is >250m from nearest TC and outside the zone of drawdown influence from dewatering activities.

RHDHV Reference	Location	Property Carried Through to Refined Assessment	Distance from the Onshore Cable Route, Onshore Substation, EACN or Access Road (direction)	Property Removed from Further Assessment and Reasoning
RH09 (SD)	Jennings Farmhouse, Ardleigh Road Manningtree, CO11 2QB	No	330m (northeast)	
RH10 (SD)	The Coach House Manningtree, CO11 2PP	Yes	185m (northeast) from Construction/ Access Road and 220m (northeast) from TC	-
RH11a (SD)	Little Bromley Hall Manningtree, CO11 2PP	Yes	205m (northeast) from Construction / Access Road and 245m (northeast) from TC	-
RH11b (SD)	Little Bromley Hall Manningtree, CO11 2PP	No	320m (northeast)	North / northeast of the onshore project area, it is >250m from nearest TC and outside the zone of drawdown influence from dewatering activities.
RH12 (SD)	The Old Rectory, Manningtree, CO11 2PP	No	265m (north)	
RH13	Barlon House, Little Bromley Road, Manningtree, CO11 2PP	No	300m (south)	South of the onshore project area, it is >250m from nearest TC and outside the zone of drawdown influence from dewatering activities.
RH14	Hiskleys Farm Kennels, Spratts Lane, Manningtree, CO11 2PR	Yes	150m (south) from the Construction / Access Road and 180m (south) from TC	-

RHDHV Reference	Location	Property Carried Through to Refined Assessment	Distance from the Onshore Cable Route, Onshore Substation, EACN or Access Road (direction)	Property Removed from Further Assessment and Reasoning
RH15	Triangle Farm, Spratts Lane, Manningtree, CO11 2PR	No	325m (south)	South of the onshore project area, it is >250m from nearest TC and outside the zone of drawdown influence from dewatering activities.
RH16	Woodside, Spratts Lane, Manningtree, CO11 2PR	No	325m (south)	
RH17 (SD)	Paynes Cottage, Payne's Ln, Little Bromley, Manningtree CO11 2PJ	Yes	20m (west) from the Construction / Access Road and 35m (north) from OCR / TC	-
RH18	Richmond Cottage, Paynes Lane, Little Bromley, CO11 2PJ	Yes	120m (north) from the Construction / Access Road and 160m (north) from OCR / TC	-
RH19 (SD)	Crabtrees, Paynes Lane, Little Bromley, CO11 2PJ	No	150m (northwest)	The nearest point of the abstractions are located to the northwest and north of the access road to the OCR, it is >250m from nearest TC / OCR the onshore cable route and outside the zone of drawdown influence from dewatering activities.
RH20a (SD)	Mulleys Farm, Bentley Rd, Manningtree CO11 2PL	No	255m (northwest)	
RH20b (SD)	Mulleys Farm, Bentley Rd, Manningtree CO11 2PL	No	285m (northwest)	

RHDHV Reference	Location	Property Carried Through to Refined Assessment	Distance from the Onshore Cable Route, Onshore Substation, EACN or Access Road (direction)	Property Removed from Further Assessment and Reasoning
RH21 (SD)	Mulleys Cottage, Bentley Rd, Manningtree CO11 2PL	No	305m (north)	
RH22 (SD)	Grove Cottage, Bentley Rd, Manningtree CO11 2PL	No	325m (north)	
RH23	The Haywain Commercial Premises, Bentley Rd, Manningtree CO11 2PL	No	355m (north)	
RH24	Oakwood, Bentley Road, Little Bentley, Colchester CO7 8SS	Yes	35m (southwest) from Construction / Access Road and >250m (south) from OCR / TC	-
RH25	Orchard Cottage, Bentley Road, Little Bentley, Colchester CO7 8SS	Yes	10m (southwest) from Construction / Access Road and >250m (south) from OCR / TC	-
RH26 (SD)	Craigus and Welhams Farm, Bentley Rd, Colchester CO7 8SS	No	50m (northeast)	Distance is from the access road whereby dewatering activities are unlikely during the construction / upgrade of the road (if required) and it is >250m from areas of OCR / TC. The survey undertaken by Wardell Armstrong and discussed in Section 4.2 indicates the

RHDHV Reference	Location	Property Carried Through to Refined Assessment	Distance from the Onshore Cable Route, Onshore Substation, EACN or Access Road (direction)	Property Removed from Further Assessment and Reasoning
				well to be installed at depth into the Chalk below the confining London Clay.
RH27	John Jiggens Limited, Hempstalls Farm, Horsley Cross, Manningtree CO11 2NZ	No	30m (west)	Utilised for spray irrigation and located adjacent to construction compound and access road whereby dewatering activities are unlikely during the construction of the road and it is >250m from areas of OCR / TC. The survey undertaken by Wardell Armstrong identified through discussions with the farm that the well was intermittently used and often ran dry.
RH28	Dypaca, Thorpe-le-Soken, Clacton-on-Sea CO16 0LE	No	215m (southwest)	Distance is from access roads utilised to construct the onshore cable route whereby dewatering activities are unlikely during the construction / upgrade of the road (if required) and it is >250m from areas of OCR / TC.
RH29	Thorpe Park Farm, Thorpe Park House, 1 - 5 Thorpe Park Cottages, Clacton-on-Sea CO16 0HN	No	150m (west)	
RH30a	A H Brown Farms Dairy House Farm, Frinton-on-Sea, CO13 0EX	No	0m (north)	Scoped out of the assessment based on a survey undertaken in December 2024 (refer to Section 4.2 for more details).
RH30b	A H Brown Farms Dairy House Farm, Frinton-on-Sea, CO13 0EX	Yes	80m (north) from the Construction / Access Road and 120m (north) from OCR / TC	-

EACN – East Anglia Connection Node, OSWA – Onshore Substation Works Area, OCR – Onshore Cable Route and TC - Trenchless Crossing

5 Hydrogeological Impact Assessment

5.1 The Project

79. The proposed onshore works will include the following components:

- Up to 11 temporary construction compounds (TCC). Assumed to include no below ground development except for shallow topsoil stripping.
- Up to 192 jointing bays – 4m x 15m with a depth of 2.15 metres below ground level (m bgl).
- Trenched onshore cable route to a maximum depth of 2m bgl.
- Trenchless crossing points at depths of up to 20m bgl (trenchless crossing locations shown on Figure 1).
- An onshore substation (shown on Figure 1), with maximum dimensions of approximately 280m x 210m. The piling solution for the onshore substation area will be determined post consent, following ground investigations (GI).
- An onshore substation works area (shown on Figure 1), encompassing additional land required for ancillary infrastructure for the onshore substation (i.e. access, drainage, landscaping, environmental mitigation and enhancements) and to facilitate the onshore substation's construction.

5.2 Conceptual Site Models

80. A CSM was defined at a high level in Section 2 and Section 3, the following sections provide refined CSMs for sections of the onshore project area where PWS locations have been grouped together based on location and associated risk level to further refine the risks posed cumulatively. BGS borehole data (summarised in Appendix B) located within 250m of the PWS and information obtained from the SLR Private Water Supply Monitoring Report (February 2025) has been used to support the assessment.

5.2.1 Private Water Supplies RH07, RH10 and RH11a

81. PWS RH07 is located 10m north from the construction / access road and 60m east from onshore cable route / trenchless crossing under Ardleigh Road shown on Figure 7f.

82. RH10 and RH11a are located 185m northeast and 205m northeast of the construction / access road, respectively and are both within 250m from the onshore cable route / trenchless crossing (detailed in Table 13) under Barlon Road 220m and 245m, respectively. These PWS are shown on Figure 7f.

83. The PWS RH07, RH10 and RH11a geology comprises of Cover Sands superficial deposits comprising predominantly sands and gravels, underlain by the Kesgrave Catchment Sands and Gravels and the London Clay. The BGS

borehole closest to PWS RH07, RH10 and RH11a is TM02NE15, located 45m north of RH07 (shown on Figure 5 and summarised in Appendix B) records superficial deposits comprising of Cover Sands to 2.70mbgl (31.70m OD) and Glacial Sandy Gravel to 9.10mbgl (25.30m OD) (likely to be the Kesgrave Catchment Sands and Gravels) and London Clay Formation to depths greater than 10.10mbgl (24.30m OD).

84. The SLR Private Water Supply Monitoring Report (February 2025) Indicates that RH07 resting water level in July / August 2024 was 1.40m bgl and RH10 and RH11a resting water level in July / August 2024 was 2.63m bgl to 3.44m bgl respectively. Based on the Hungersdown data from the past 5 years, the groundwater level tends to fluctuate between 0.50m to 2.00m per year, with the winter peak being a period of higher groundwater levels. As the monitoring was undertaken in July / August it is anticipated that the winter peak water levels will potentially be higher.

85. Given the proximity of PWS RH07, 60m east of the proposed trenchless crossing zone (shown on Figure 7f), there is considered to be a strong potential hydraulic connection between the onshore project area and RH07 and therefore the potential impacts in regards to water quality and dewatering have been assessed further in the Risk Assessment in Section 6.

86. Additionally, given the proximity of PWS RH10 and RH11a from the onshore cable route / trenchless crossing(<250m, as detailed in Table 11), there is considered to be a potential hydraulic connection between the onshore project area and PWS RH10 and RH11a and therefore the potential impacts in regards to water quality have been assessed further in the Risk Assessment in Section 6. The risks in relation to dewatering impacts are considered to be very low based on the monitored groundwater levels and the fact that a trenchless crossing is proposed.

5.2.2 Private Water Supplies RH14, RH17 and RH18

87. RH14 is located 150m south of the construction / access road and 180m from onshore cable route / trenchless crossing proposed under Spratts Lane. RH17 and RH18 are located 20m and 120m from the construction / access road (Payne's Lane) respectively and RH17 and RH18 are located 35m and 160m from the onshore cable corridor/ trenchless crossing zone, respectively. These PWS are shown on Figure 7e.

88. The PWS RH14, RH17 and RH18 geology comprises of Cover Sands superficial deposits underlain by the Kesgrave Catchment Sands and Gravels and the London Clay Formation. However, BGS boreholes with pertinent information related to the site are not located within 250m of PWS RH14, RH17 and RH18 to confirm the actual geology present.

89. The SLR Private Water Supply Monitoring Report (February 2025) Indicates that RH17 reaches a depth of 3.06m bgl with groundwater levels at 1.40m bgl. It is anticipated that the water level may rise during the winter peak to <1.00m bgl. Please note monitoring has not been undertaken on RH14 and RH18,

therefore water levels are unknown at this stage and further groundwater monitoring is recommended in Section 7.

90. The risks in relation to dewatering impacts to PWS RH14 are considered to be very low on the basis that a trenchless crossing is proposed and has therefore not been considered further in relation to this impact. There is the potential for impact in relation to water quality therefore this has been assessed further in the Risk Assessment in Section 6.

91. Given the proximity of RH17 and RH18 from the onshore cable route / trenchless crossing (<200m detailed in Table 13), and the shallow groundwater level in RH17 there is considered to be a strong potential hydraulic connection between the onshore project area and PWS RH17 and RH18 and therefore the potential impacts in regards to water quality and dewatering have been assessed further in the Risk Assessment in Section 6.

5.2.3 Private Water Supplies RH24 and RH25

92. PWS RH24 and RH25 are located 10m to 35m of the construction / access road to the onshore cable route and are all located >250m from area of trenchless techniques. These PWS are shown on Figure 7e.

93. The PWS RH24 and RH25 geology comprises of Cover Sands superficial deposits underlain by the Kesgrave Catchment Sands and Gravels and the London Clay Formation. However, BGS boreholes with pertinent information related to the site are not located within the 250m of PWS RH24 and RH25.

94. The SLR Private Water Supply Monitoring Report (February 2025) indicates that RH24 resting water level was at 1.26m bgl. Please note monitoring has not been undertaken on RH25 so therefore water levels are unknown at this stage and further groundwater monitoring is recommended in Section 7.

95. Given the distance of PWS RH24 and RH25 from the proposed trenchless crossing zone (>250m detailed in Table 13) they have not been considered further in regards to the dewatering impacts however these PWS are located within 50m of the access/ construction road and have therefore been assessed further in the risk assessment in Section 6 in regards to water quality.

5.2.4 Private Water Supplies RH30b

96. RH30b is located 80m east from the construction / access road and 120m north from the onshore cable route / trenchless crossing under Main Road (B1032) shown on Figure 7a.

97. The geology at RH30b comprises of the Kesgrave Catchment Sands and Gravels superficial deposits comprising predominantly sands and gravels, underlain by the London Clay. BHLC-3 is located 500m west of RH30b (shown on Figure 7a), and records Made Ground to 2.00m bgl (21.40m OD) and superficial deposits comprising of Kesgrave Catchment Sands and Gravels to 4.50m bgl (18.90m OD) and London Clay Formation to the base of the borehole so to depths greater than 20.00m bgl (3.40m OD).

98. A survey undertaken in December 2024, reported RH30b to have groundwater levels from 3.00m bgl to 10.00m bgl (base of the borehole). This variation is likely related to the groundwater abstraction confirmed to be for agricultural purposes only (refer to Section 4.2 for more details). However due to this variation, further baseline groundwater monitoring is recommended in Section 7.

99. Given the proximity of RH30b (80m) from the construction/ access road and 120m north from the onshore cable route / trenchless crossing (shown on Figure 7a), there is considered to be a strong potential hydraulic connection between the onshore project area and RH30b and therefore the potential impacts in regards to water quality and dewatering have been assessed further in the Risk Assessment in Section 6.

6 Risk Assessment

6.1 Potential Effects

100. The construction aspects of the proposed onshore Project (detailed in Section 1.2) have the potential to alter the groundwater quality, level and flow direction. Potential groundwater impacts are:

- Machinery such as excavators and drills used in trenchless crossing zones can act as a potential source of contamination and the disturbance of soils can potentially create a pathway for suspended materials to be introduced into the water environment.
- Drilling fluids used during trenchless crossings e.g. trenchless crossing of roads and watercourses (locations shown on Figure 1 and 7), can potentially enter the water environment.
- Groundwater flow could be changed as a result of the construction works which has the potential to impact surrounding private water abstractions.
- Cement bound sand may be used during the trenching within the onshore cable route which could impact both surface water and groundwater quality.

6.1.1 Conceptual Site Model Summary

101. Following the baseline assessment detailed in Section 2 and conceptual site model detailed in Section 3, the main hydrogeological receptors identified within the onshore project area are considered to be PWS from shallow superficial aquifers overlying the London Clay Formation. Groundwater levels within the superficial aquifers are recorded close to the surface and may have high groundwater vulnerability.

102. Based on the hydrogeological impact assessment and CSM detailed in Section 5 the PWS considered to be at risk from potential dewatering and adverse water quality impacts associated with the construction works along the onshore cable route are shown on Figure 8. These positions are:

- RH07 – Normans Farm.
- RH17 – Paynes Cottage.
- RH18 – Richmond Cottage.
- RH30b – A H Brown Farms Dairy House.

103. Additionally, locations that are within 250m to the above ground construction activities within the onshore cable route which may be at risk from adverse impacts on water quality are shown on Figure 8 (Appendix D). These positions are:

- RH10 – The Coach House.
- RH11a – Little Bromley Hall.
- RH14 – Hiskeys Farm Kennels.
- RH24 – Oakwood.
- RH25 – Orchard Cottage.

104. There are four locations whereby the initial baseline groundwater level monitoring and abstraction assessment visit needs to be undertaken. These positions are:

- RH14 – Hiskeys Farm Kennels
- RH18 – Richmond Cottage.
- RH25 – Orchard Cottage.
- RH30b – A H Brown Farms Dairy House.

6.2 Embedded Mitigation

105. The North Falls 7.13 Outline Code of Construction Practice (Revision 2) **[REP3-017]** includes details of the best practice techniques and procedures with potential options on soil management (Section 1.6), pollution prevention (Section 1.2.5 and 1.3.10), emergency response procedures (Section 1.3.10) and temporary site drainage (Section 1.8).

106. Also, the relevant construction works will be carried out in accordance with good practice guidance and the following documents and regulatory guidance:

- CIRIA 552 Contaminated Land Risk Assessment, A Guide to Good Practice (2001).
- Environment Agency's Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (2001).
- CIRIA SP156 Control of Water Pollution from Construction Sites - Guide to Good Practice (2002).
- CIRIA C649D Control of water pollution from linear construction projects. Site guide (2006).

- CIRIA C698 Site Handbook for the Construction of SuDS (2007).
- Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009).
- CIRIA (C753F) The Sustainable Drainage System (SuDS) Manual, December (2015).
- CIRIA C502 Environmental Good Practice on Site C741, CIRIA (2015).
- CIRIA C741 Environmental Good Practice on Site.
- CIRIA (C532) Control of water pollution from construction sites: Guidance for consultants and contractors.
- CIRIA Report C648 Control of Pollution from Linear Construction Project Technical Guidance.
- UK Government Oil storage regulations for businesses (2023).
- UK Government Manage water on land: guidance for land managers (2024).
- UK Government Pollution Prevention for Business (2024).
- UK Government Discharges to surface water and groundwater: environmental permits (2024).
- UK Government Report an Environmental Incident.

107. Pollution Prevention guidance provides environmental good practice for the whole of the UK and will be followed where appropriate. It should be noted that the following documents do not stipulate government guidance for England. Guidance for Pollution Prevention includes:

- PPG1: Understanding your environmental responsibilities – good environmental practices.
- PPG5: Works and maintenance in or near water.
- PPG6: Working at construction and demolition sites.
- PPG8: Safe storage and disposal of used oils.
- PPG11:Preventing pollution at industrial sites.
- GPP20: Dewatering underground ducts and chambers.
- PPG21: Pollution incident response planning.
- PPG 22: Dealing with spills.

6.3 Impact on Groundwater Flows

108. The Thames Group is considered an unproductive aquifer and outcrops beneath 40.6% of the onshore project area, predominantly in the centre and southeastern extent of the onshore cable corridor route (shown on Figure 3

and Figure 4). Therefore, in areas where superficial deposits are not recorded, it is considered decidedly unlikely that groundwater will be encountered.

109. Superficial deposits including Cover Sands and Kesgrave Catchment Sands and Gravels are present in areas across the whole onshore project area, particularly in the northwest area (shown on Figure 3) along with a number of PWS (shown on Figure 7).

110. GI and post GI groundwater monitoring data indicates that the groundwater level is generally recorded within the Cover Sands and Kesgrave Catchment Sands and Gravels from 1.70m bgl (24.62m OD) to 5.18m bgl (31.82m OD) and therefore it is considered likely that dewatering will be required at some locations to enable construction.

111. As outlined within Section 4.3, a total of 33 PWS are recorded within 250m of the onshore project area or in close proximity to a proposed trenchless crossing zone. Three PWS and one licenced abstraction is considered to be at risk from dewatering impacts associated with the construction works along the onshore cable route (detailed in Section 6.1) and an additional four PWS may be at risk from adverse impacts on water quality. The monitored PWS that may be subject to dewatering impacts are summarised in Table 14.

Table 14 Summary of Monitored PWS including licenced abstraction that May be Impacted by Dewatering

RH Location ID	Location Address	Distance from Cable Route (m)	Well Details	
			Depth to Base (m)	Depth to Water (m)
RH07	Normans Farm	60	3.30	1.40
RH17	Paynes Cottage	35	3.06	1.40
RH18	Richmond Cottage	160	Not Known	Not Known
RH30b	Dairy House Farm	120	10.00	3.00 to 10.00 base of BH

112. Hungerdowns Farm Groundwater dip data trend indicates that groundwater levels are higher following winter (referred to as the winter peak) and steadily decrease throughout the end of the year. Therefore, groundwater levels in July/ August 2024 is likely to be similar to groundwater levels following dry summer periods allowing a conservative assessment.

113. RH30b has a groundwater level at 3.00m bgl to 10.00m bgl, which is below the maximum depth of trenching so any dewatering required is unlikely to adversely impact water supply. The groundwater levels may rise to 2.00m bgl (base of trench) during the winter peak, however the BH will still have 8m of well below any potential dewatering. Therefore, dewatering associated with trenching is considered unlikely to significantly impact on the viability of the supply and the potential impact on abstraction RH30b is therefore assessed a 'low'.

114. RH07 and RH17 are both located within 50m from the onshore cable route with water encountered at 1.40m bgl. As the proposed trenching will extend up

to 2.00m bgl (0.60m below the groundwater level), possible dewatering associated with construction activities has the potential to impact groundwater levels at the PWS locations. However, as the boreholes extend to >3.00m bgl, at least 1.00 m of groundwater will remain at the base of both wells (assuming as a worst case that the impact of dewatering lowers the water table at the supplies to 2.0m bgl).

115. The construction works and associated dewatering has the potential to impact water supply, in particular RH07 and RH17 and consequently appropriate monitoring is outlined within Appendix D. The purpose of the monitoring is to confirm the potential for significant impact and to outline mitigation measures (e.g. alternative groundwater supplies) that can be put into place if needed. The potential impact on groundwater levels and flows at RH07 and RH17 is therefore currently assessed as 'low' to 'moderate'.

116. Additionally, RH14, RH18, RH25 and RH30b were not monitored during the July / August 2024 Wardell Armstrong monitoring, therefore groundwater monitoring is recommended in these locations.

6.4 Impact on Groundwater Quality

6.4.1 Construction Works

117. Suspended solids may result from the construction works along the onshore cable route and may pollute the water environment if these are not managed effectively. Additionally, spillages of fuels or chemicals during construction and mobilisation of plant could potentially contaminate the water environment. Therefore, the onshore cable route construction works will be undertaken in accordance with the management plans and guidance outlined in Section 6.2 to ensure construction will be completed in an environmentally safe manner and lower the potential for spillages.

118. Best practice techniques will be incorporated within the management procedures for the onshore cable route construction activities to protect the water environment from pollution incidents, as outlined in the North Falls Outline Code of Construction Practice **[REP3-017]**. Key mitigation measures are summarised as follows:

- During construction and operation there will be heavy machinery required onsite and, as a result, it is appropriate to adopt best working practices and measures to protect the water environment, including those set out in the Pollution Prevention Guidance (PPG1).
- Above ground fuel and chemical storage related to the construction works along the onshore cable route will be bunded in accordance with PPG2.
- An emergency spill response kit will be maintained during construction works along the onshore cable route.

- To reduce the potential conflicts between vehicles and thereby reduce the risk of vehicle collision, a vehicle management system and speed limit will be put in place.
- Infrastructure e.g. Entry and exit pits for trenchless crossings such as HDD and site access points etc. will be located at least 10 metres from any watercourse or surface water drain or bedrock outcrop wherever possible.

119. If the construction works along the onshore cable route is undertaken in line with the embedded mitigation, the risk to groundwater quality is assessed as 'negligible' to 'low'. However, the superficial aquifers underlying the onshore cable route have shallow recorded groundwater (detailed in 2.11 and 6.1) and may have a high groundwater vulnerability and therefore monitoring has been proposed to ensure that there is no deterioration in water quality or quantity during construction work. Namely, initial baseline groundwater level monitoring and abstraction assessment is required at RH14, RH18, RH25 and RH30b. Additionally, RH07, RH17, RH18 and RH30b are considered to be at risk of potential dewatering and adverse water quality impact and RH10, RH11a, RH14, RH24 and RH25 are considered to be at risk of adverse water quality impacts.

6.4.2 Trenching - Cement Bound Sand

120. The trenched onshore cable route will be backfilled using Cement Bound Sand (CBS) to the base of the sub-soil layer or appropriate depth required to ensure thermal conductivity of the material around the cables is of a known consistent value. This is normal best practice for high voltage onshore cable routes. As of February 2025, the exact specification of the CBS used on site has not yet been confirmed. During the storage, preparation and mixing of the CBS, the highest risk is likely to occur to the surface water environment and will be controlled by the appropriate locating of these activities away from watercourses and through measures to ensure that there is no direct discharge of run-off, as outlined within the North Falls Outline Code of Construction Practice **[REP3-017].**

121. During the operational phase, the risk posed to groundwater will potentially be caused by leaching of contaminants and the migration of these contaminants through the superficial aquifers. Initial chemical concerns relate to the highly alkaline nature of the cement and the potential of heavy metals contaminants including chromium, particularly chromium VI.

122. It is considered that the water environment close to the onshore cable route construction works is relatively insensitive, except for nearby PWS. Given that cement forms only a minor constituent of the CBS, the overall risk to the water environment inclusive of surface water and shallow groundwater, is considered to be low.

123. Routine monitoring of pH and chromium, including chromium VI will be undertaken at the water supplies located within a 100m radius of any CBS

placed during construction i.e. RH07, RH17 and RH30b. The proposed monitoring schedule is outlined in Appendix D.

124. As the underlying Thames Group is considered an aquitard there is negligible risk from the use of cement for trench backfilling purposes to the Chalk aquifer at depth.

6.4.3 Trenchless Crossings Drilling Fluids

125. The trenchless crossings (zones shown on Figure 7) are likely to be constructed using HDD, or similar techniques, which will include the use of drilling fluids to lubricate and cool the drill bit and string. All drilling will be undertaken by an approved contractor and undertaken in accordance with relevant best practice including BS5930:2015 BS EN 16228-3.

126. During HDD operations, drilling mud (bentonite) is used which is a non-toxic, inert natural clay mineral and is therefore not considered to pose a direct risk to groundwater quality. The concerns to the water environment may therefore be related to potential release of returned mud to the water environment, potentially increasing suspended solids within a water environment.

127. There is also the potential for hydraulic fracture and breakout to occur. When drilling is undertaken near a water supply or beneath a watercourse this could result in drilling fluid entering a well if the drilling movement or fracturing were to create a preferential pathway between the drill hole and the well (causing breakout). The Outline Horizontal Directional Drill Method Statement and Contingency Plan [**REP1-037**] was developed to ensure that the risk from breakout is minimised.

128. Breakout can result in impacts close to the drill location and therefore monitoring is proposed at RH07, RBH10, RH11a, RH14, RH17, RH18 and RH30b (which are all located close to trenchless crossing zones shown on Figure 7) to ensure that there is no impact on water quality. The proposed monitoring schedule is outlined in Appendix D.

6.4.4 Piling

129. The piling solution for the onshore substation area will be determined post consent, following GI. If piling is required (dependent on the methodology), to minimise the potential risk to groundwater, a piling risk assessment will be developed outlining the methodology / piling method and protocols, as outlined within the North Falls Outline Code of Construction Practice **[REP3-017]** (Section 1.4). Boreholes advanced as part of the GI will be installed within the superficial deposits and monitored for groundwater quality and level. The groundwater testing results should be assessed against pre-agreed criteria before, during and after any piling activity.

130. Any environmental incidents during piling operations or elevated contaminant levels would lead to a suspension of the works to allow the pathways to be identified and/or the piling methodology to be reviewed to ensure the most

appropriate response. If deemed necessary, the exact requirements of the response would be outlined within a piling risk assessment.

131. It is noted that there are no water supplies located within 250m of proposed onshore substation and therefore the risk from this activity on these supplies is considered to be very low.

132. Due to the thickness of the London Clay being up to 35.00m, it is considered highly unlikely that any piling would extend below the base of the clay.

7 Monitoring and Mitigation

133. An outline groundwater monitoring and mitigation plan (attached as Appendix D) has been completed detailing the proposed survey / monitoring to be undertaken before, during and after the construction phase of the Project. This includes a topographical survey, baseline and extended water monitoring and water quality monitoring. The outline groundwater monitoring and mitigation plan outlines steps to ensure that the PWS and licenced abstraction at risk of dewatering and contamination impacts (listed in Section 6.1) are not impacted during the onshore cable route construction works.

7.1 Survey

134. A groundwater survey has already been completed on thirteen of the identified PWS and licenced abstraction shown in Table 12, however it is noted that no groundwater level was available for RH14 (Hiskeys Farm), RH18 (Richmond Cottage) andRH25 (Orchard Cottage)therefore additional surveys will be undertaken prior to finalisation of the monitoring plan. Additionally, the groundwater data obtained for licenced abstraction RH30b (A H Brown Farms Dairy House) is recorded from 3.00m bgl to 10.00m bgl and therefore due to this variation further baseline monitoring is required.

135. In addition, further discussion with the owners is required, regarding the PWS and the licenced abstraction to confirm that the locations are in-use and that there will be an ongoing need for the supply during the construction phase. Once this has been confirmed, a full location and topographical survey is proposed to ensure the distance from the onshore cable route is accurate. The monitoring plan and this assessment will be updated prior to commencement of the construction phase.

7.2 Monitoring

136. Whilst the risk to groundwater quality is assessed as negligible to low, the risk to groundwater levels is assessed as low to moderate. Therefore an outline monitoring regime has been provided within Appendix D to ensure impact on either water supply or water quality to the PWS and licenced abstraction (listed in Section 6.1) can be identified at the earliest opportunity and mitigation put into place as required. In order to confirm this assessment is accurate, the monitoring requirement would be confirmed prior to commencement of the construction phase through consultation with the supply owners.

137. Pump tests could be undertaken to further refine the PWS and licenced abstraction assessment and to support the Monitoring Plan in Appendix D.

138. If any PWS locations or licenced abstractions do not require the supply during the construction period (i.e. due to lack of need or an existing alternate supply) then these will be removed from the monitoring schedule and groundwater monitoring undertaken instead.

139. PWS or licenced abstractions not included in the groundwater monitoring are shown in Table 13 as they are either in excess of 250m from any potential dewatering and/or remote from any significant construction activity which could impact water quality. RH26 has also been excluded from the groundwater monitoring as the PWS is abstracting from the Chalk bedrock which is not hydraulically connected to the proposed works. RH30a is also not included in the groundwater monitoring as its been confirmed that it is not in use.

7.3 Mitigation

140. If adverse impacts on water supplies does occur, the appropriate mitigation is outlined in Appendix D e.g. the provision of an alternate supply during construction phase and, if a long-term impact is indicated, rehabilitation or provision of a replacement supply.

8 Summary and Conclusions

141. A Groundwater Risk Assessment has been undertaken to assess the potential impact of the proposed landfall, onshore cable route and onshore substation construction works on the local and regional hydrogeology and to specifically assess the potential impact on PWS and licenced abstractions.

142. A Hydrogeological CSM for the onshore project area has been developed in Section 2 and summarised in Section 3 which confirms that the primary groundwater pathway along the route consists of a shallow superficial aquifer comprising Cover Sand underlain by sands and gravels of the Kesgrave Catchment Sands and Gravels.

143. Available monitoring data indicates that the superficial aquifer varies between 0m and 20m in thickness within the onshore project area, with a shallow water table generally between 1m and 2m below ground level, occasionally rising to less than 1m during winter peaks. The underlying bedrock (which is present at surface where superficial deposits are not recorded) comprises of low permeability London Clay, which is not considered to be water bearing and which acts as an aquitard to the underlying Chalk aquifer (and therefore is not considered to be a potential receptor).

144. A total of eight PWS and one licenced abstraction located within a 250m radius of the onshore cable corridor could feasibly be impacted by construction activities including dewatering and construction related to potential contamination.

145. There are no groundwater dependent ecological sites along the onshore project area. However, a spring is located 125m southwest of the onshore project area, north of Thorpe-Le-Soken. However, given that springs are not recorded within the onshore project area these are not likely to be significant features.

146. A qualitative hydrogeological impact assessment concludes that if works are undertaken in accordance with appropriate good practice and the measures outlined within developed management plans the potential risk to the identified groundwater abstractions is low to moderate. Additionally, a groundwater monitoring plan has been developed (refer to Appendix D) to allow for ongoing monitoring of water supplies throughout the construction phase and ensure that there are no adverse impacts on water supplies.

147. A summary of the findings of this assessment is included as Table 15 and the affected abstractions are identified on Figure 8.

Table 15 Summary of Refined Groundwater Risk Assessment and Mitigation

RH Location ID	Location Address	National Grid Reference	Distance from Potential Onshore Cable Route Dewatering Activities (direction) or feature that has triggered further assessment type and feature	At Risk From Dewatering Activities	At Risk From Water Quality Issues	Where Mitigation is Secured
RH07	Normans Farm	608458E 228481N	10m (north) Construction / Access Road and 60m (east) from OCR / TC	✓	✓	The North Falls Outline Code of Construction Practice **[REP3-017]** Sections 1.8.1.6 and 1.4.1. Development Consent Order Requirement 15.
RH10	The Coach House	609084E 227925N	185m (northeast) from Access / Construction Road and 220m (northeast) from OCR / TC	-	✓	
RH11a	Little Bromley Hall	609149E 227910N	205m (northeast) from Construction / Access Road and 245m (northeast) from OCR / TC	-	✓	
RH14	Hiskleys Farm Kennels	609645E 227199N	150m (south) from Access / Construction Road and 180m (south) from OCR / TC	-	✓	
RH17	Paynes Cottage	610149E 227444N	20m (west) from the Construction / Access Road and 35m (north) from OCR / TC	✓	✓	
RH18	Richmond Cottage	610155E 227569N	120m (north) from the Construction / Access Road and 160m (north) from OCR / TC	✓	✓	
RH24	Oakwood	610634E 227073N	35m (southwest) from Construction / Access Road	-	✓	
RH25	Orchard Cottage	610694E 227052N	10m (southwest) from Construction / Access Road	-	✓	
RH30b	A H Brown Farms Dairy House	620900E 219000N	80m (north) from the Construction / Access Road and 120m (north) from OCR / TC	✓	✓	

EACN – East Anglia Connection Node, OSWA – Onshore Substation Works Area, OCR – Onshore Cable Route and TC - Trenchless Crossing.

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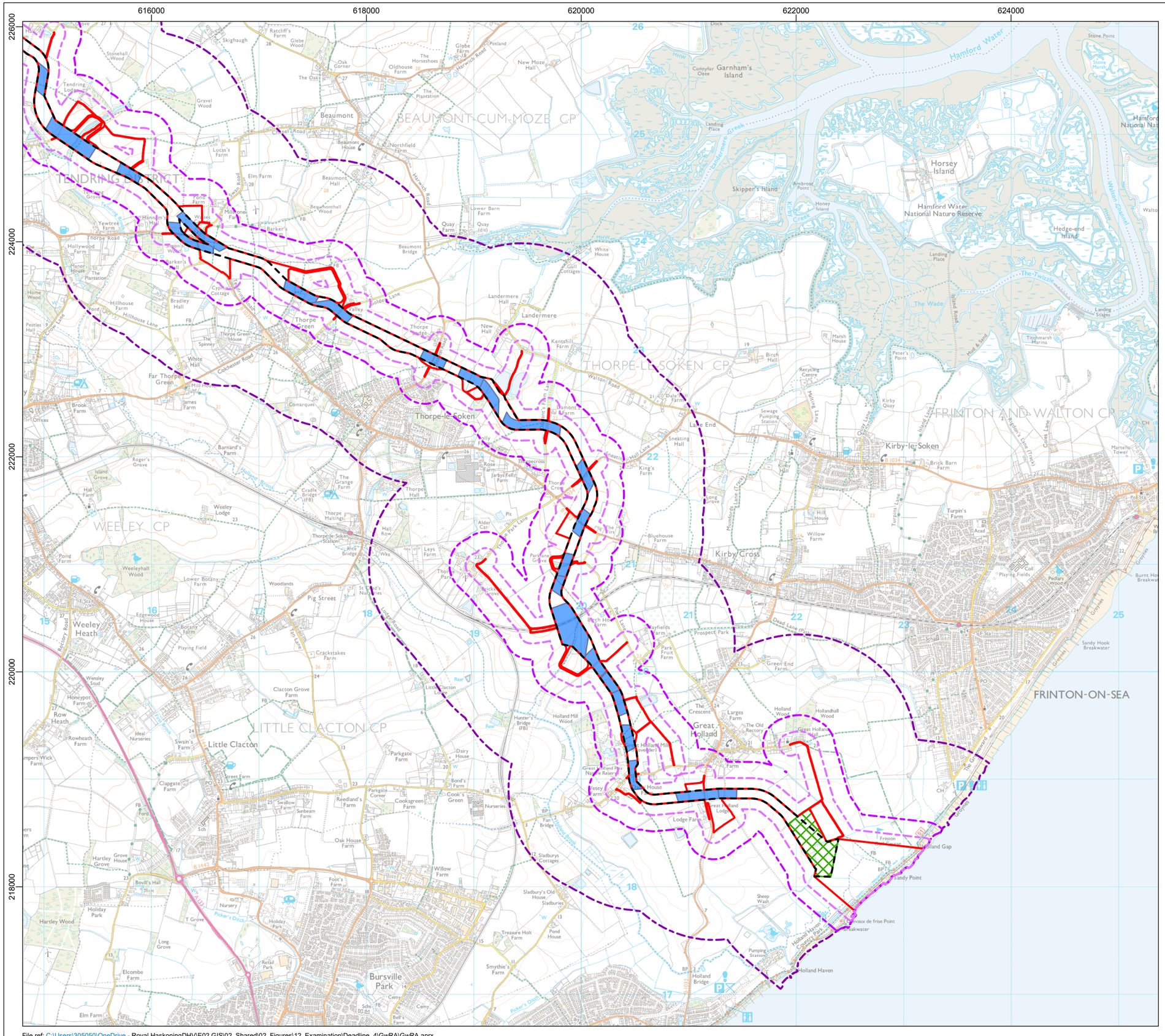

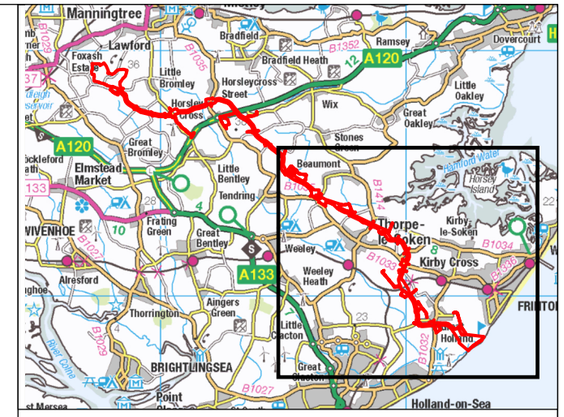

Legend

- Onshore Project Area
- Onshore Cable Route
- Landfall Compound
- Trenchless Crossing Zone

Onshore Project Area Buffers

- 100m
- 250m
- 1km

0 0.5 1 2 km

N

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Drawing Title

Site Location

Rev	Date	Remarks	Drwn	Chkd
01	11/04/2025	First issue	FC	AW

Drawing Number	Figure Number
PB9244-RHD-ZZ-ON-DR-GS-0662	1a

Scale	Plot Size	Datum	Projection
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NORTH FALLS
Offshore Wind Farm

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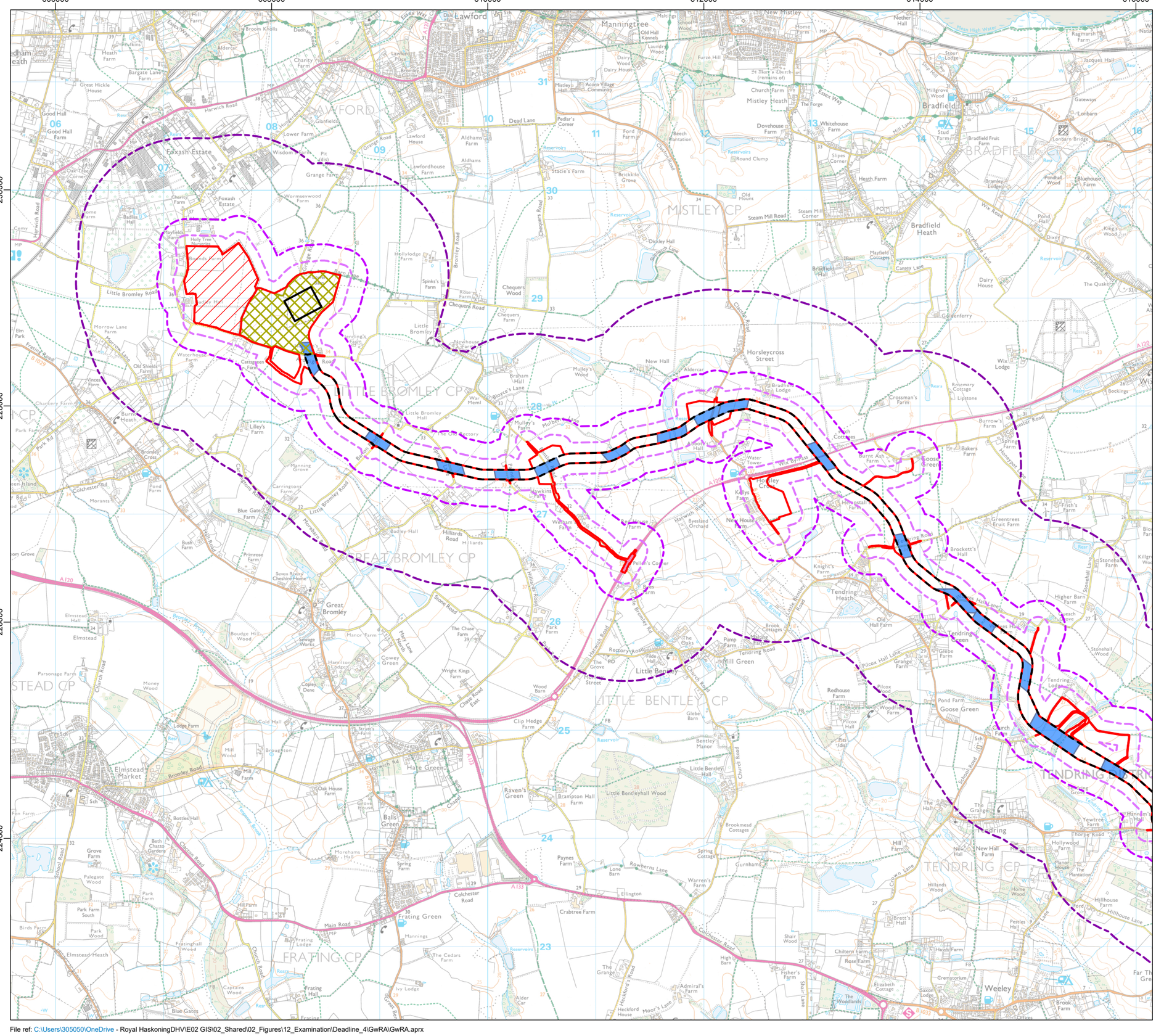

Legend

- Onshore Project Area
- Onshore Substation
- East Anglia Connection Node (EACN)
- Onshore Cable Route
- Trenchless Crossing Zone
- Substation Works Area

Onshore Project Area Buffers

- 100m
- 250m
- 1km

0 0.5 1 2 km

N

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Drawing Title

Site Location

Rev	Date	Remarks	Drwn	Chkd
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Drawing Number	Figure Number
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Scale	Plot Size	Datum	Projection
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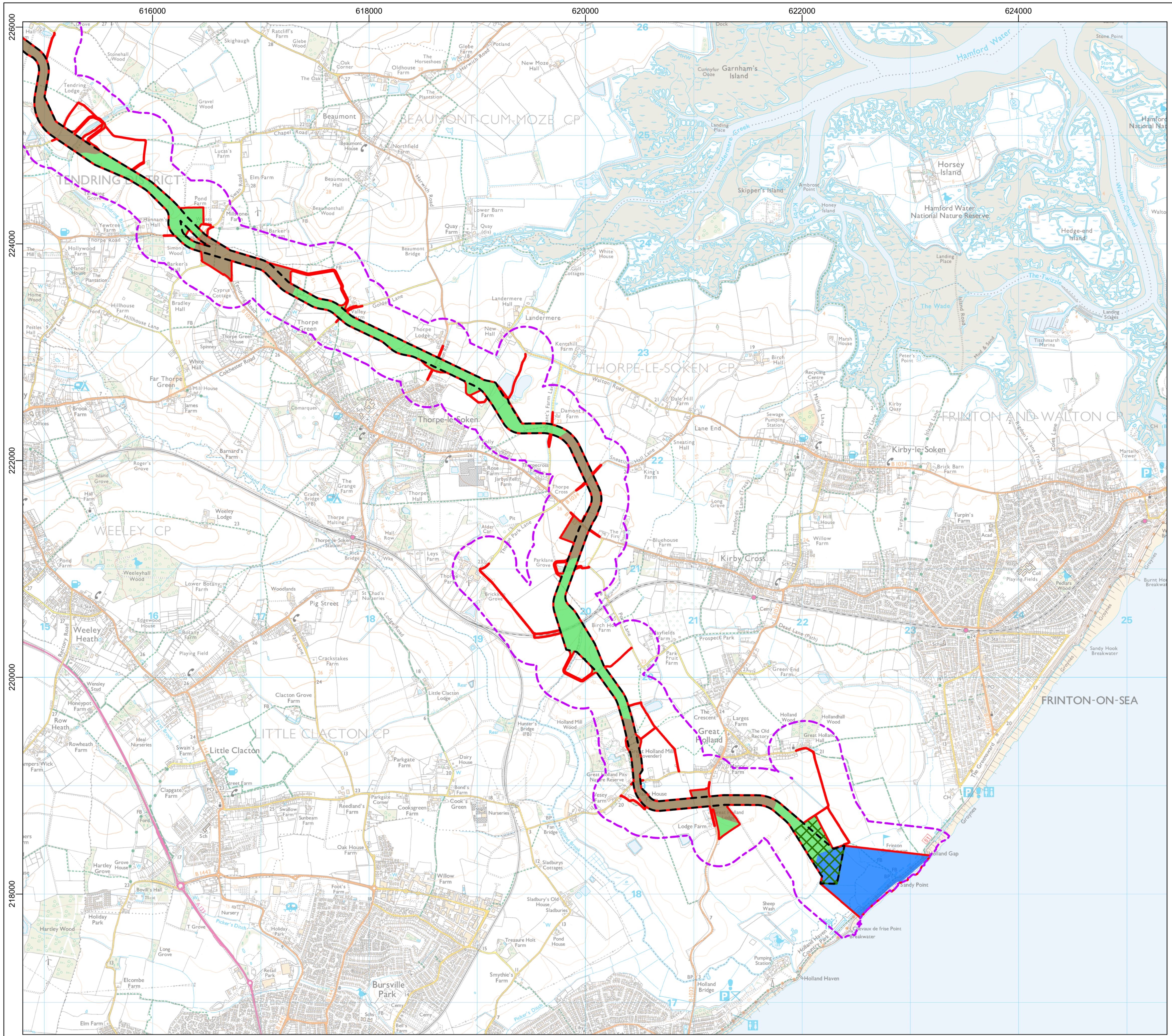

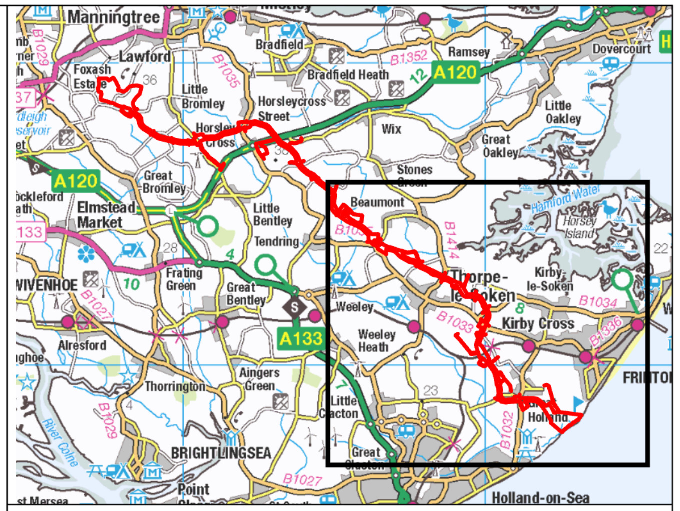

Legend

- Onshore Project Area
- Onshore Cable Route
- Landfall Compound

Onshore Project Area Buffer

- 250m

Soil Type

- Loamy and Clayey Soils of Coastal Flats with Naturally High Groundwater
- Slightly Acid Loamy and Clayey Soils with Impeded Drainage
- Slowly Permeable Seasonally Wet Slightly Acid but Base-Rich Loamy and Clayey Soils

0 0.5 1 2 km

N

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Drawing Title

Soilscapes

Rev	Date	Remarks	Drwn	Chkd
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Drawing Number	Figure Number
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NORTH FALLS

Offshore Wind Farm

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North Falls Offshore Wind Farm Limited

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