

Dogger Bank C/Sofia Onshore Works Application

Appendix 2 –

Hydrology and Water Resource Assessment



Hydrology and Water Resource

Doc. No. PM763-ARCUS-00001;
003655558-01
Rev. no. 01
Valid from: July 2020

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1 Introduction

1.1 Purpose of the Report

This Hydrology and Water Resource Assessment accompanies the Environmental Appraisal which is submitted to support the planning application made by Doggerbank Offshore Wind Farm Project 3 Projco Limited (the Projco) and Sofia Offshore Wind Farm Limited (SOWFL) (the Applicants), for consent pursuant to Section 62 of the Town and Country Planning Act 1990 as amended¹ (the Application).

A Development Consent Order (2015 DCO) was granted for Dogger Bank Wind Farm C (previously known as Dogger Bank Teesside A Offshore Wind Farm) and Sofia Offshore Wind Farm (previously known as Dogger Bank Teesside B Offshore Wind Farm) (the Applicants' Projects), including the onshore transmission works required to export electricity to the grid in August 2015.

The Application includes five areas of alternative and additional infrastructure to the consented 9 kilometres (km) buried onshore grid connection, spanning from the landfall for Dogger Bank Wind Farm C (DB-C) and Sofia Offshore Wind Farm (Sofia) to the National Grid at Lackenby Substation (the Works). Figures 1.2 (a - c) of the Environmental Appraisal show the location of the Works and the consented 2015 DCO.

This Report determines the potential impacts of the Works in comparison to the works consented under the 2015 DCO with respect to hydrology and water resources. Where the potential for impacts is identified, mitigation measures and residual impacts are presented (only where additional to the 2015 DCO).

This Report provides a summary of the 2014 Environmental Statement (ES) and 2020 baseline environment and subsequently assesses the potential effects of the Works (Section 4) taking into account the necessary assessment criteria and concludes that the proposed changes have no additional effect on significance.

The information presented in this Report demonstrates that there is no alteration to the 'realistic worst-case' as assessed and accepted within the 2014 ES (see Table 5.1). It can be concluded with a very high degree of confidence that there will be no increase in effects on relevant receptors from those identified within the 2014 ES.

1.2 Development Context

For the ease of reference, the Works, as shown in Figure 1.2 (a – c) of the Environmental Appraisal, are split into areas as below:

- Area 1 – A174 Crossing;
- Area 2 – South of Kirkleatham Memorial Park;
- Area 3 - Wilton East;
- Area 4 - Main Welfare Hub south of Wilton; and
- Area 5 - HVAC Cable Corridor.

¹ UK Government (1990) Town and Country Planning Act 1990 [Online] Available at: <http://www.legislation.gov.uk/ukpga/1990/8/contents> (Accessed on 11/05/2020)

1.3 Document Structure

This Report is structured as follows:

- Introduction;
- Methodology;
- Baseline for Assessment;
- Assessment of Potential Effects;
- Mitigation and Enhancement;
- Cumulative Effects; and
- Summary and Statement of Change/No Change.

This Report should be read in conjunction with Annex A - Flood Risk Assessment (FRA) and with Chapter 24 - Geology, Water Resources and Land Quality of the 2014 ES.

2 Methodology

2.1 Introduction

This Section provides a baseline with regard to the sensitivity of hydrology and water resources and identifies the likely implications and effects upon them from the Works. Where potential adverse impacts are predicted, appropriate mitigation actions are proposed to reduce or remove them completely. Best practice measures are also outlined.

2.2 Guidance

The policy, legislation, guidance and standards applicable to hydrology and water resources were detailed in Chapter 24 of the 2014 ES. For this Application, the following changes in policy and guidance have been implemented since the 2014 ES (in relation to flood risk and drainage):

- National Planning Policy Framework (NPPF) – latest update in June 2019;²
- NPPF Planning Practice Guidance (PPG) ‘Flood Risk and Coastal Change’ updated in March 2020³, which includes the Environment Agency (EA) ‘Flood Risk Assessments: Climate Change Allowances’ guidance⁴;
- SuDS Manual (C753) dated 2015⁵;

² UK Govt (2019) National Planning Policy Framework (NPPF) [Online] Available at <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

³ UK Govt (2020) Planning Practice Guidance (PPG) Flood Risk and Coastal Change [Online] Available at <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

⁴ UK Govt (2020) Flood Risk Assessments: Climate Change Allowances [Online] Available at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

⁵ CIRIA (2015) The SuDS Manual (C753)

- DEFRA ‘Sustainable drainage systems: non-statutory technical standards’ dated March 2015⁶;
- Local planning policy contained within Redcar and Cleveland Local Plan, adopted May 2018⁷; and
- Level 1 Strategic Flood Risk Assessment (SFRA) Redcar and Cleveland Borough Council (RCBC) dated May 2016⁸.

The outlined changes to policy, legislation, guidance and standards do not materially affect the conclusions of the 2014 ES or the technical work which informed it. The technical work which informs this Report has been undertaken with reference to the latest guidance where applicable.

This Report has been prepared based on the following sources of information:

- Proposed plans of the Works provided by the Applicants;
- EA published ‘Open Data’ datasets available online, reproduced with OS mapping under licence to Stantec (contains Ordnance Survey data © Crown copyright and database right [2019], contains EA information © EA and database right);
- EA online flood maps at <https://flood-map-for-planning.service.gov.uk/> and <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>;
- Level 1 SFRA Update; RCBC, May 2016;
- 2014 ES Chapter 24 – Geology, Water Resources and Land Quality, March 2014, Royal Haskoning DHV (on behalf of Forewind), dated March 2014; and
- FRA – Stantec – doc ref 46941-4005 dated June 2020.

Consultation with RCBC in its role as Lead Local Flood Authority (LLFA) regarding existing flood risk issues was undertaken by means of a pre-application data request in April 2020. RCBC confirmed that a formal Flood Risk Assessment (FRA) was not required to support the Application and as such, it has been incorporated into Annex A. Further correspondence with the LLFA has confirmed the design standards governing discharge rates and control of flooding for surface water management schemes (detailed further in Section 5.2).

A site walkover was undertaken in March 2020, with the purpose of walking the entirety of the Works and identifying watercourses and drainage features within the additional areas included in the Application. The identified areas are detailed in Section 3.2. The walkover helped to confirm that there are no material changes to the baseline assessment detailed in the 2014 ES in relation to existing watercourses.

2.3 Scope

This Report determines the potential impacts of the Works in comparison to the 2015 DCO Limits with respect to hydrology and water resources during the realistic worst case construction scenario (i.e. concurrent construction of DB-C and Sofia).

The Works relating to this Application include an underground cable trench, temporary construction compounds and temporary accesses. The Works do not include any operational above ground infrastructure i.e. Onshore Converter Stations (OCS) and therefore, operational effects are scoped out of this assessment.

⁶ DEFRA (2015) Sustainable drainage systems: non statutory technical standards [Online] Available at <https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards>

⁷ Redcar and Cleveland Borough Council (2018) Local Plan

⁸ Redcar and Cleveland Borough Council (2016) Level 1 Strategic Flood Risk Assessment (SFRA)

At time of decommissioning, it will be evaluated whether the buried cable systems could be used for another purpose. If this is not feasible, it will be isolated and left in place unless otherwise specified by RCBC. As there will likely be no decommissioning effects as a result of the Works, decommissioning is scoped out of this assessment.

3 Baseline for Assessment

3.1 Summary of 2014 ES Baseline Pertinent to Works

3.1.1 Hydrology

There are no EA designated 'Main Rivers' within the area of the Works or within 2 km in the surrounding area. The closest main rivers to the Works are the River Tees, approximately 4 km to the north-west and Skelton Beck, approximately 3 km to the south-east.

The 2014 ES stated that the area within the 2015 DCO Limits is potentially influenced by a number of 'ordinary' watercourses - Rogers Dike, Mains Dike and Kettle Beck along with a number of smaller un-named watercourses and drainage ditches.

In total, the Works will span seven waterbodies, including the named watercourses above. A watercourse crossing schedule, which summarises all watercourses within the Works is provided in Table 3.2.

3.1.2 Water Resources

The UK Soil Observatory (UKSO)⁹ online 'Soilscapes for England and Wales' viewer indicates that the entire area of the Works is located on "*slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils*".

The area of the Works is not located within an EA Groundwater Source Protection Zone (SPZ). The nearest SPZ to the Works is located at a distance greater than 2 km.

There is a single discharge consent within the planning application boundary and 19 consents within 500 m of that footprint. All of the consents relate to sewage processing or disposal.

There are no known private or public water supply infrastructure within the area of the Works.

⁹ UK Soil Observatory [Online] Available at: <http://www.landis.org.uk/soilscapes/> (Accessed June 2020)

3.1.3 Water Quality

The closest EA surface water quality monitoring points are located in excess of 3 km from the Works, on Skelton Beck. Analysis of the monitoring points (sourced from 2014 ES Chapter 24) is summarised in Table 3.1. There is no available data for the watercourses within the Works.

Table 3.1: Summary of Water Quality

Sample Location ID	National Grid Reference		Distance from the Works (km)	Period of data availability	Analytical suites	2009 Grade
	X	Y				
Tocketts Mill – Saltburn Gill (Skelton Beck)	462760	518100	>3	1990-2009	Ammonia Dissolved Oxygen Nitrates Phosphates	Chemistry – C Biology – B Nitrates – 2 Phosphates - 4
Howl Beck – Tocketts Mill (Skelton Beck)	462040	518400	>3	1990-2009	Ammonia Dissolved Oxygen Nitrates Phosphates	Chemistry – A Biology - / Nitrates – 3 Phosphates – 2

The chemistry of the Tees Mercia Mudstone & Redcar Mudstone groundwater body (sourced from 2014 ES Chapter 24) is classified as 'At Risk', with 2009 Chemical Quality classified as 'Poor' and 2016 Chemical Quality also classified as 'Poor'.

3.1.4 Flood Risk and Drainage

A FRA was completed as part of the 2014 ES, specifically Chapter 24, Appendix B. The key conclusions from the 2014 FRA can be summarised as:

- The Onshore Converter Stations (OCS) and adjacent construction compound are located within Flood Zone 1, demonstrating it is at 'low' (less than 1 in 1000 (0.1%)) probability of flooding from fluvial or tidal sources;
- Drainage solutions are proposed within the design to reduce the rate of surface water runoff from the OCS site.

Much of the 2015 DCO Limits comprise greenfield agricultural land which drains northwards via the ordinary watercourses. It is our understanding from previous correspondence with Northumbrian Water, undertaken by Forewind as part of the 2014 FRA, that there were no records of historic flooding that would affect the 2015 DCO Limits.

The only instances of historic sewer flooding were in the nearby urban areas of Marske-by-the-Sea, New Marske and Redcar.

3.2 Review of Baseline

There are no material changes to the baseline assessment detailed in the 2014 ES in relation to hydrology, water resources and water quality.

The Works that will occur at or in the direct vicinity of any identified watercourse, are shown in Table 3.2 below. These are the watercourses within areas identified for the Application. Dwg 46941/4001/001 in Annex A - FRA shows the location of these watercourses.

Table 3.2: Watercourse Crossing Schedule for the Works

Watercourse Ref/ID (Dwg 46491-4001-001 – included in FRA)	Description	Nature of Works & Area of Works	Anticipated Cable Installation Method
2	Field Drain (unnamed)	Compound (Area 1)	-
3	Roadside Ditch	Cable Crossing Compound (Area 1)	Trenchless (Horizontal Directional Drilling (HDD)) or other trenchless technique
4	Field Drain	Cable Crossing (Area 1)	Trenchless HDD or other trenchless technique
8	Watercourse (Mains Dike)	Cable Crossing (Area 3)	Trenchless HDD or other trenchless technique
9	Watercourse (unnamed)	Cable Crossing (Area 3)	Trenchless HDD or other trenchless technique
11	Field Drain/Culvert	Cable Crossing Compound (Area 3)	Trenchless HDD or other trenchless technique
13	Watercourse/Culvert (unnamed)	Cable Crossing (Area 4)	Trenchless HDD or other trenchless technique

A review of the current SFRA and EA online flood map indicated that the Works that will occur at, or in the direct vicinity of, any identified watercourse, shown in Table 3.2, remain within Flood Zone 1.

There are no changes in the baseline for the Works in comparison to the 2014 ES in terms of water resources and water quality.

4 Assessment of Potential Effects

4.1 Summary of 2014 Potential Effects

4.1.1 Construction Phase

The activities that were identified as being considered likely to impact water resources, water quality and flood risk during the construction phase of the Applicants' Projects in the 2014 ES included:

- Construction of the High Voltage Direct Current (HVDC) and High Voltage Alternating Current (HVAC) onshore cable systems –including open cut trenching and HDD installation techniques;
- Construction of temporary compounds / laydown areas;
- Construction of temporary access tracks;
- Temporary stockpiling of topsoil and other excavated soils;
- Cable laying activities;
- Landscaping activities using excavated material;
- Reinstatement of excavated topsoil and some subsoil to backfill the trenches;
- There are a number of routing constraints where HDD or other trenchless method will be used to bypass infrastructure and features including roads, watercourse, historical landfills etc.

The 2014 ES concluded that any effects associated with the construction phase were deemed to be temporary in nature (limited to construction activities only), reversible and of low magnitude.

Construction activities were stated to have the potential to impact the hydrogeology in the following ways:

- Excavation, disturbance of soil, and drilling at depth has the potential to temporarily open the soil structure and/or remove some of the protective clay (glacial till) layer, potentially creating pathways for the mobilisation and transmission of contaminants;
- Potential for chemically aggressive ground to be present; and
- Spills and leaks of contaminants could affect superficial geology and perched groundwater quality.

The 2014 ES concluded that prior to any mitigation measures, the construction activities were likely to have a minor adverse impact on hydrogeology.

The construction activities were stated to have the potential to impact on local water resources in the following ways:

- Increased potential for surface water runoff and sediment contaminant discharge to watercourses through excavation of trenches, watercourse crossings, spillages of contaminants, and removal of topsoil;
- Dewatering of groundwater to surface water;
- HDD techniques beneath watercourses could increase surface water pollution; and
- Excavation, disturbance of soil, and drilling at depth has the potential to temporarily open the soil structure and/or remove some of the protective clay (glacial till) layer, potentially creating pathways for the mobilisation and transmission of contaminants.

The 2014 ES concluded that prior to any mitigation measures, the construction activities were likely to have a minor adverse impact on hydrology, water resources and water quality.

Activities associated with the construction of the cable route as part of the 2015 DCO will not result in any increased impermeable surfacing and is also considered to be a low magnitude effect.

4.2 Additional Effects from the Works

Construction activities for the Works are broadly anticipated to be similar to the corresponding works proposed in the 2014 ES. This Application does not cover the OCS so those impacts are not relevant.

Following liaison with the LLFA and the information collected during the site walkover, it is concluded that there are no new waterbodies affected by the Works when compared to the 2015 DCO Limits.

The waterbodies identified as receiving effects in the 2014 ES will be affected in broadly the same way, albeit some crossings will be located further upstream or downstream than in the 2015 DCO Limits, however the methods for crossings are not expected to change (e.g. HDD or other trenchless method).

Given that the majority of the Works considered in the Application are temporary and all permanent infrastructure would be located below ground and are not affect by flooding, it is not necessary to further consider the impact of climate change or potential mitigation measures.

There is no requirement for permanent foul water drainage infrastructure associated with any aspect of the Works being considered under this Application.

There are no additional effects in relation to water quality, water resources, flood risk and drainage that have been identified as a result of the Works.

5 Mitigation and Enhancement

5.1 Summary of 2014 ES Mitigation

Table 5.1 summarises the impacts for each phase of the Works consented under the 2015 DCO and key mitigation measures previously identified in the 2014 ES in relation to hydrology and water resources.

Table 5.1: Mitigation Measures

Description of Impact	Key Mitigation Measures
Construction Phase	
Discharge of contaminants to surface geology, soils and shallow groundwater	<ul style="list-style-type: none"> • Good operational practices should be adopted in the construction phase; • Store oil and fuel within designated areas in impervious storage bunds with a minimum of 110% capacity to contain any leakages or spillages.
Surface runoff and sediment or contaminant discharge to watercourses	<ul style="list-style-type: none"> • Entry into water will be avoided where possible; • A temporary haul road bridge should be constructed if repeated crossings are required; • Straw bales and sandbags will be incorporated to prevent silty runoff entering the watercourse;

Description of Impact	Key Mitigation Measures
	<ul style="list-style-type: none"> Silt traps will be used when required to prevent silt polluting downstream reaches of the watercourses Specific consideration of the Water Resources Act 1991 (and associated Land Drainage Byelaws) will be required where the cable corridor passes within 8 m of a main river; If cement is likely to be batched on site, a suitable area should be designated, located at an appropriate distance from the watercourse; Adherence to best practices and guidance to ensure the risk of pollution is minimised; Where earthworks are undertaken, soil and water will be managed with sufficient care to prevent surface water runoff; Stockpiles will be designed and positioned in order to minimise erosion, pollution of watercourses or increase flood risk.
Dewatering of groundwater to surface water	<ul style="list-style-type: none"> If there is a requirement for dewatering of excavations, water will be pumped out and passed through a settlement tank or lagoon to allow suspended solids to settle out before being discharged to an appropriate location; Appropriate treatment methods will be adopted prior to discharge of the water from any land drains uncovered during the construction phase.
HDD (or other trenchless method) beneath watercourses	<ul style="list-style-type: none"> In accordance with best practice, the HDD will commence at a safe distance from the edge of each watercourse. The distance will be agreed with the EA prior to commencement of the works; The process of HDD involves the use of bentonite (used as a lubricating agent and grout); in order to reduce the risk of pollution of surface waters and / or break out in the river bed the use of these materials should be carefully controlled; In order to reduce the likelihood of pollution from bentonite and / or grout when working near rivers, hydrophobic (water repelling) grout and quick setting mixes should be used; If cement etc. is likely to be batched on site a suitable area should be designated and located at an appropriate distance from the watercourse; Adherence to the CDM Regulations where applicable.

The 2014 ES concluded that with the above mitigation measures in place, the residual impact during the construction phase is considered to be negligible.

5.2 Additional Enhancement Measures from the Works

The Works will have a negligible effect if the relevant mitigation measures under the 2015 DCO requirements are substantively secured for this Application through planning conditions as is proposed.

The nature of the Works and low level of flood risk means that there is no requirement for mitigation measures to be implemented to manage flood risk locally or the potential effect of these Works on flood risk elsewhere.

There is still the potential for the surface water runoff regime to be affected by the Works, albeit temporarily. In particular there will be the potential for an impact at the construction compounds or construction accesses where temporary surfacing will be provided. Consultation with the LLFA as part of this assessment has confirmed the design standards to be used when mitigating surface water runoff (as detailed in Section 5 of the Hydrology and Drainage Report, 2020).

In accordance with Policy SD7 of the Redcar and Cleveland Local Plan 2018 and consultation with RCBC, surface water greenfield runoff rates will be restricted to QBAR value with sufficient storage within the system to accommodate a 1 in 30-year storm. The design shall also ensure that storm water resulting from a 1 in 100-year event, plus climate change surcharging the system, can be stored on site.

The mitigation measures required will ultimately be detailed in the Code of Construction Practice (CoCP) and Catchment Environmental Management Plan (CEMP) secured by planning conditions. Details pertaining to the timetable and phasing for construction of the drainage systems, duration of their intended use and management and maintenance of the drainage system during construction activities will be provided by the CEMP. Details of any control structures or surface water storage structures and measures to control silt levels will also be provided.

It is noted that there is the potential for works at the watercourses to install the cable corridor to temporarily affect the function of the watercourse and conveyance of water. Access crossings are likely to require Land Drainage Consent for the completion of these works in due course from RCBC, as the LLFA.

All watercourses are planned to be crossed using trenchless techniques such as HDD. Consequently, there is no anticipated impact on the watercourse and no further mitigation will be required.

Welfare facilities associated with the Works would be temporary and suitable measures implemented under the 2015 DCO CoCP and CEMP would be adhered to, to manage any foul effluent arising during construction. The mitigation measures required will be detailed in the CoCP and CEMP being secured for this application through planning conditions.

There are no mitigation measures required of the decommissioning phase as the Works include a cable route, temporary construction compounds and temporary accesses only. Any works associated with the OCS are permitted by the 2015 DCO.

6 Cumulative Effects

6.1 Summary of 2014 ES Cumulative Projects

The 2014 ES considered whether impacts on a receptor could occur on a cumulative basis between the onshore elements of the Applicants' Project and other activities, projects and plans for which sufficient information regarding location and scale exist. The projects considered were the Tees Renewable Energy Plant Underground Cable, York Potash Project, Dogger Bank Teesside C & D offshore wind farm onshore cable connection, the demolition of the Teesside Power Station and the Onshore Renewables project.

It is assumed that the mitigation measures detailed in the 2014 ES will be applied to the above projects, as committed to by their developers, therefore the residual impacts identified for construction, operation and decommissioning are not anticipated to change. It is a condition of planning that developments have no detrimental impact on flood risk and drainage and therefore no cumulative impacts are expected.

Flood risk within the 2015 DCO Limits relates to surface water runoff only. As runoff associated with each development is restricted to the greenfield runoff rate, with attenuation measures required, there would be no cumulative impacts in relation to flood risk.

6.2 Additional Cumulative Effects

There will be no additional cumulative effects in relation to water resources, water quality and flood risk that have been identified as a result of the Works in comparison to the works consented under the 2015 DCO.

7 Summary and Statement of Change/No Change

It can be concluded with a very high degree of confidence that there will be no increase in effects on relevant receptors from those identified within the 2014 ES.

In terms of hydrology, this assessment demonstrates that the Works give rise to no new or materially different environmental effects than those identified within the 2014 ES. Accordingly, no additional mitigation measures to those secured in the 2015 DCO are required.

Table 7.1: Summary of Change/No Change

Receptor	2014 ES Effect Significance	Additional Effect Significance	Change/No Change
Watercourses (flood risk and water resources)	Minor Adverse without mitigation Negligible following mitigation measures	N/A	No Change
Surface Water Quality	Minor Adverse without mitigation Negligible following mitigation measures	N/A	No Change
Groundwater Quality	Minor Adverse without mitigation Negligible following mitigation measures	N/A	No Change