MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Outline Bentonite Breakout Plan

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Term	Meaning
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Windfarm Limited (Morecambe OWL).
Code of Construction Practice	A document detailing the overarching principles of construction, contractor protocols, construction-related environmental management measures, pollution prevention measures, the selection of appropriate construction techniques and monitoring processes.
Development Consent Order	An order made under the Planning Act 2008, as amended, granting development consent.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Landfall	The area in which the offshore export cables make landfall (come on shore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area at Lytham St. Annes between Mean Low Water Springs and the transition joint bay inclusive of all construction works, including the offshore and onshore cable routes, intertidal working area and landfall compound(s).
Mean High Water Springs	The height of mean high water during spring tides in a year.
Mean Low Water Springs	The height of mean low water during spring tides in a year.
Morecambe OWL	Morecambe Offshore Windfarm Limited is owned by Copenhagen Infrastructure Partners' (CIP) fifth flagship fund, Copenhagen Infrastructure V (CI V).
Morgan OWL	Morgan Offshore Wind Limited is a joint venture between JERA Nex bp (JNbp) and Energie Baden-Württemberg AG (EnBW).
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The transmission assets for the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm. This includes the offshore substation platforms, interconnector cables, Morgan offshore booster station, offshore export cables, landfall site, onshore export cables, onshore substations, 400 kV grid connection cables and associated grid connection infrastructure such as circuit breaker compounds. Also referred to in this report as the Transmission Assets, for ease of reading.
Offshore export cables	The cables which would bring electricity from the offshore substation platforms to the Transition Joint Bays.
Offshore export cable corridor	The corridor within which the offshore export cables will be located.
Onshore export cables	The cables which would bring electricity from the Transition Joint Bays to the onshore substations.
Onshore export cable corridor	The corridor within which the onshore export cables will be located.

Term	Meaning
Onshore substations	The onshore substations will include a substation for the Morgan Offshore Wind Project: Transmission Assets and a substation for the Morecambe Offshore Windfarm: Transmission Assets. These will each comprise a compound containing the electrical components for transforming the power supplied from the generation assets to 400 kV and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National Grid.
Main rivers	The term used to describe a watercourse designated as a Main River under the Water Resources Act 1991 and shown on the Main River Map. These are usually larger rivers or streams and are managed by the Environment Agency.
Marine Conservation Zone	A national statutory conservation designation established under the Marine and Coastal Access Act 2009. These zones are designated to protect nationally important, rare, or threatened marine habitats and species. The legislation empowers authorities to manage and conserve these areas, ensuring the protection of marine biodiversity and geological features.
National Grid Penwortham substation	The existing National Grid substation at Penwortham, Lancashire.
Ramsar sites	Wetlands of international importance that have been designated under the criteria of the Ramsar Convention. In combination with Special Protection Areas and Special Areas of Conservation, these sites contribute to the national site network.
Special Protection Areas	A site designation specified in the Conservation of Habitats and Species Regulations 2017, classified for rare and vulnerable birds, and for regularly occurring migratory species. Special Protection Areas contribute to the national site network.
Site of Special Scientific Interest	A national statutory conservation designation in the UK, recognizing areas of significant ecological or geological value. These sites are legally protected under the Wildlife and Countryside Act 1981, as amended by the Countryside and Rights of Way Act 2000 and the Natural Environment and Rural Communities Act 2006. This legislation empowers Natural England to designate and manage SSSIs, ensuring their protection and conservation.

Acronyms

Acronym	Meaning
CoCP	Code of Construction Practice
DCO	Development Consent Order
EA	Environment Agency
EnBW	Energie Baden-Württemberg AG
HDD	Horizonal Directional Drilling
HNDR	Holistic Network Design Review
HDPE	High-Density Polyethylene

Acronym	Meaning
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

Units

Unit	Description
%	Percentage
m	Metre

1 Outline bentonite breakout plan

1.1 Introduction

1.1.1.1 This document forms the Outline Bentonite Breakout Plan prepared for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (referred to hereafter as 'the Transmission Assets').

1.1.1.2 The Outline Bentonite Breakout Plan was updated at Deadline 6 to include the following:

- Measures (commitments) adopted as part of Transmission Assets relating to the Outline Bentonite Breakout Plan.
- Update to Requirement 8 wording in line with the draft Development Consent Order (DCO) (document reference C1 (REP3-009)) to include Blackpool Operations Limited (BAOL) as a consultee along with the relevant management plans with the relevant management plans upon which BAOL will be consulted by the relevant planning authority.

1.2 Implementation

1.2.1 Overview

This Outline Bentonite Breakout Plan forms an appendix to the Outline Code of Construction Practice (CoCP) (document reference J1). Following the granting of consent for the Transmission Assets, detailed Bentonite Breakout Plans will be prepared as a part of the detailed Code of Construction Practice(s) on behalf of Morgan OWL and/or Morecambe OWL, prior to commencement of the relevant stage of works and will follow the principles established in this Outline Bentonite Breakout Plan. The detailed Bentonite Breakout Plans will require approval by the relevant planning authority following consultation with relevant stakeholders. The Applicants and all appointed contractors will be responsible for the implementation of the detailed Bentonite Breakout Plans.

1.2.1.1 The Applicants have committed to implementation of detailed Bentonite Breakout Plan via the following commitment, CoT77 (see Volume 1, Annex 5.3: Commitments Register, document reference F1.5.3), and is secured by inclusion of Requirement 8 of the draft Development Consent Order (DCO) (document reference C1) Schedules 2A & 2B which state, respectively:

8.—(1) No stage of the Project A onshore works or Project A intertidal works may commence until for that stage a code of construction practice has been submitted to and approved by the relevant planning authority following consultation as appropriate with:

(a) Lancashire County Council;

(b) Natural England;

(c) the Environment Agency;

(d) in relation to the Project A intertidal works or, if applicable to the Project A offshore works, the MMO.

(e) in relation to the Project A Blackpool Airport works, BAOL to the extent specified in the outline code of construction practice.

(2) Each code of construction practice must accord with the outline code of construction practice and include, as appropriate to the relevant stage…

(m) bentonite breakout plan (in accordance with the outline bentonite breakout plan); …

(3) The code of construction practice approved in relation to the relevant stage of the Project A onshore works must be followed in relation to that stage of the Project A onshore works and Project A intertidal works

(3) The code of construction practice approved in relation to the relevant stage of the Project A onshore works must be followed in relation to that stage of the Project A onshore works.

1.2.1.2 Requirement 8(1)(e) identifies BAOL as a named consultee prior to the approval by the relevant planning authority of detailed codes of construction practice. BOAL will be consulted in relation to a stage of construction that includes either the Project A Blackpool Airport Works or the Project B Blackpool Airport Works. With regards to the management plans to be appended (as appropriate to the relevant stage) to the detailed codes of construction practice, BAOL will be consulted on the Bentonite Breakout Plan and (in accordance with the outline Bentonite Breakout Plan by the relevant planning authority)

1.2.1.3 The Transmission Assets may adopt a staged approach to the approval of DCO requirements. This will enable requirements to be approved in part or in whole, prior to the commencement of the relevant stage of works in accordance with whether staged approach is to be taken to the delivery of the each of the offshore wind farms.

1.2.1.4 For onshore and intertidal works (landward of Mean Low Water Springs (MLWS)), this approach will be governed by the inclusion of Requirement 3 within the draft DCO which requires notification to be submitted to the relevant planning authority detailing whether Project A or Project B relevant works will be constructed in a single stage; or in two or more stages to be approved prior to the commencement of the authorised development.

1.2.2 Purpose of this Outline Bentonite Breakout Plan

1.2.2.1 The purpose of a bentonite breakout plan is:

- Minimise the potential for a bentonite breakout associated with the trenchless technique crossings
- Provide for the timely detection of bentonite breakouts

- Identify how ecologically sensitive areas will be protected
- Ensure an organised, timely and minimum impact incident response
- Establishes procedures to ensure that the Environment Agency and any other relevant authority is notified and that the incident is documented.

1.3 Roles and Responsibilities

1.3.1 Overview

1.3.1.1 The key roles and associated responsibilities with regard to this Outline Bentonite Breakout Plan are set out below. The Construction (Design and Management) Regulations 2015 also identify the legal duties, responsibilities and obligations of all the major roles within the construction team.

1.3.1.2 The responsibilities of each role will be refined in the detailed Bentonite Breakout Plan.

1.3.2 Applicants

1.3.2.1 The Applicants will be responsible for the following:

- Ensuring that the outline Bentonite Breakout Plan is implemented effectively
- Giving necessary direction to contractors (for example, setting contractual obligations)
- Preparing the detailed Bentonite Breakout Plan(s) undertaking reviews and refinements (where necessary) in conjunction with the Principal Contractor.

1.3.3 Principal Contractors

1.3.3.1 Principal Contractor(s) will be appointed by Morgan OWL and Morecambe OWL and have the overall responsibility for:

- Delivering the outline and detailed Bentonite Breakout Plan on behalf of the Applicants
- Ensuring all procedures in the outline and detailed Bentonite Breakout Plan are followed, in particular the erection and maintenance of the construction fencing.

1.3.4 Contractors/Subcontractors

1.3.4.1 Contractors and subcontractors will be responsible for implementing the measures within the Bentonite Breakout Plan.

1.4 Sensitive features

1.4.1.1 Features have been identified at landfall and along the onshore export cable corridor and 400kV grid connection cable corridor where use of open cut trenching techniques has been discounted or are less favourable due to the sensitivity of the features encountered. The obstacles identified along the route and proposed crossing methodologies being considered are presented within the Onshore Crossing Schedule (document reference F1.3.3).

1.4.1.2 At landfall, the sensitive features to be crossed by direct pipe include St Annes Old Links golf course, a railway line, the Lytham St Annes Dunes Site of Special Scientific Interest (SSSI) and the A584 Clifton Drive North.

1.4.1.3 One of the most significant trenchless crossings proposed along the onshore export cable corridor is the crossing of the River Ribble which is designated by the Environment Agency (EA) as a 'Main River'. The designation of 'Main River' is made by the EA generally to larger arterial watercourses. For crossings beneath a 'Main River' consultation and approval from the EA is required. At the location of the crossing the River Ribble is also designated as the Ribble Estuary Marine Conservation Zone. Historic waste landfills are recorded to the north of the River Ribble and these are to be crossed within the same trenchless crossing. The Project Description (Volume 1, Chapter 3 of the Environmental Statement (document reference F1.3) sets out that the installation of the 400kV Grid Connection Cable Corridor beneath the River Ribble will be undertaken by direct pipe or micro tunnel trenchless installation techniques.

1.5 Commitments

1.5.1.1 Through the EIA process, the Applicants have identified commitments which seek to eliminate or reduce impacts or adopt best practice guidance as part of the Transmission Assets and are recorded within Volume 1, Annex 5.3: Commitments Register of the ES (document reference F1.5.3). Where relevant, commitments have been detailed within subsequent sections of this Outline Construction Fencing Plan. All commitments associated with onshore and intertidal construction are provided in full within Table 1.1. These will be included within and developed further as part of the detailed Bentonite Breakout Plan.

Table 1.1: Measures (commitments) adopted as part of the Transmission Assets relevant to the Outline Bentonite Breakout Plan

Commitment (CoT) number	Measure adopted	How the measure will be secured (article references may be subject to change during DCO Examination)	Where is the commitment reference within the document?
CoT77	An Outline Bentonite Breakout Plan has been prepared as part of the Outline CoCP and submitted as part of the application for development consent. CoCP(s) will be developed in accordance with the outline CoCP.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)	Section 1.2

1.6 Context

1.6.1.1 The risk of bentonite breakout associated with HDD is greater than for other trenchless techniques as the down hole pressures and volumes of drilling fluid used with HDD are higher and therefore likelihood and consequence of bentonite breakout is greater within HDD operations.

1.6.1.2 Within a HDD, drill fluid is required to:

- suspend and carry the drill cuttings from drill bit to the surface;
- stabilise the HDD bore during drilling to prevent collapse and minimise risk of loss of drilling fluid or influx of groundwater to the bore;
- cool the cutting head and reamers (cutting tools);
- make the drill string more buoyant;
- power the mud motor; and
- lubricate the drilling head, drill string during drilling phases and High-Density Polyethylene (HDPE) strings during pullback.

1.6.1.3 Breakout of drilling fluid from the HDD bore (or other trenchless drill or drive) into the surrounding ground may occur where down hole pressures exceed the confining ground pressure and has the potential to migrate to the surface.

1.6.1.4 Other trenchless techniques such as direct pipe and micro tunneling also require the use of drilling fluids to maintain drill head pressures, lubricate the drill head and remove excavated materials. Therefore, there is a risk of breakout of drill fluids associated with these methods, although they would typically be undertaken at greater depths and the volumes of fluid and pressure are generally less than those required for HDD and therefore breakout risks are reduced. The mitigations proposed and breakout response would be in line within that presented for potential breakout from HDD detailed below.

1.7 Bentonite-based drilling fluid composition

1.7.1.1 The drilling fluid used during HDD generally comprises a mixture of water and bentonite (a mined naturally occurring clay). The bentonite is delivered to site as a dried and finely ground powder and is mixed with water to form a slurry. Bentonite typically comprises 1%-5% by volume of the drill fluid depending on the ground conditions present. In addition to the bentonite, certain propriety additives (such as polyanionic cellulose or partially hydrolyzed polyacrylamide polymers) may be added to the drilling fluid during drilling to control its rheological and / or thixotropic properties.

1.7.1.2 Bentonite is classified as ‘not hazardous’ under Classification Regulation (EC) No 1272/2008 and is not classified within the

Classification Directive 67/548/ECC nor 1999/45/EC as the product is not hazardous.

1.8 Potential drilling fluid breakout

1.8.1.1 Drilling fluid breakout to the surface most commonly occurs at the HDD entry and exit points where the bore is at its shallowest. The likelihood of drilling fluid breakout occurring decreases with depth.

1.8.1.2 Drilling fluid is most likely to breakout of the HDD bore where highly fissured ground or highly permeable ground (coarse granular materials, peat, voids) are encountered.

1.8.1.3 Breakouts may also occur where man-made features are present (e.g. old site investigation boreholes).

1.8.1.4 In the event of drill fluid breakout from the bore it is only likely to reach ground level where there is a continuous path to the surface or where the drill fluid pressure exceeds the overburden pressure. The overburden pressure is the pressure exerted on a specific depth underground by the weight of the layers of material above it.

1.9 Breakout mitigations

1.9.1.1 Equipment allowing monitoring of downhole drill fluid pressure will be used to allow real time comparison with limit values from hydrofracture analysis. If the allowable pressure is exceeded the trenchless crossing works would be stopped and blockage cleared (by repeated pull back and advancement of drilling head, possibly with alternative drill head) before continuing to drill.

1.9.1.2 Ground investigation would be undertaken where required to establish ground conditions along the route of the trenchless crossing and gather relevant geotechnical information to allow trenchless crossing design and hydrofracture analysis to be undertaken at the detailed design stage.

1.9.1.3 To mitigate the risk of surface breakout close to the entry of the hole, casing can be installed to provide physical containment of the drill fluid within the casing and/or pressure of the drilling fluid could be reduced when close to the entry and exit pits.

1.9.1.4 Additional visual monitoring along the length of the bore will be undertaken (where land access is available) to check for signs of breakout to the surface.

1.9.1.5 When crossing beneath ‘Main Rivers’ a minimum trenchless crossing depth of 2m below hard bed level will be achieved through appropriate design of the drill. To further mitigate the impacts of potential drill fluid breakout, the HDD crossing entry and exit points will be sufficiently set back from watercourses to ensure sufficient depth achieved in immediate proximity to the watercourse crossing, a minimum 8m from ‘Main Rivers’ has been committed to by the Applicants via commitment, CoT10 (see Volume 1, Annex 5.3: Commitments Register, document reference F1.5.3). The final trenchless crossing depth for each

proposed drill will be defined at detailed design based on results of ground investigations, proposed trenchless technique to be utilised and detailed design.

1.10 Breakout response

1.10.1.1 If drilling fluid breakout occurs this would be able to be identified quickly at the trenchless entry compound due to falling fluid levels within mud tanks, allowing works to be stopped and action taken to seal the area of loss.

1.10.1.2 For a breakout from a HDD bore, bentonite would be reintroduced periodically to the bore under pressure to plug the breakout. If this proves unsuccessful then loss circulation materials may be introduced to the drilling fluid to plug the point of breakout.

1.10.1.3 An outline of response sequence if bentonite breakout is identified at the surface is as follows:

- On identification of breakout to the surface the drilling would be immediately stopped, decreasing fluid pressure preventing further fluids migrating to the surface;
- The bentonite breakout would be contained using sandbags, earth bunds, straw bales, silt fencing etc;
- The bentonite breakout would be covered with absorbent granules to increase viscosity, turning the drill fluid into a thick clay which can be removed from the surface. Alternatively for larger volumes, a vacuum tanker or suction pump and hose may also be required; and
- All drilling fluid at surface level would be transported to the drilling compound and assessed if suitable for reuse. If identified as unsuitable for reuse then the material would be transported to an approved waste facility.

1.10.1.4 When breakout has been identified to have occurred, no additional trenchless crossings will commence and trenchless crossings underway paused until cause of breakout is investigated. A review of the design parameters used for the trenchless crossing would be undertaken to establish if update in design or construction method statement is needed such as trenchless crossing profile, drill fluid mixture or drilling pressures.

1.11 Breakout notification

1.11.1.1 The notification process will be agreed in advance in the finalised bentonite breakout plan. Notification of a bentonite breakout will be provided to the relevant parties, if identified to have occurred, along with details of how the bentonite drill fluid has been or will be removed.

1.12 References

The Council of the European Economic Community (1967) Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances, L196, 16 August 1967, pp. 1–98.

The European Parliament and the Council of the European Union (1999) Directive 1999/45/EC of the European Parliament and of the Council concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations, L200, 30 July 1999, pp. 1–68.

The European Parliament and the Council of the European Union (2008) Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006, L353, 31.12.2008, pp. 1–1355.