

Hornsea 4

Ørsted



Hornsea Four:

Energy Balancing Infrastructure (EBI) Signposting

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1 Introduction & Background

This short document provides signposting to Energy Balancing Infrastructure (EBI) and where it has been assessed as part of the Environmental Impact Assessment (EIA) and presented in the Environmental Statement (ES) to support the Hornsea Four Development Consent Order (DCO) Application.

Clarity is also provided on:

1. References to EBI and the location of the EBI offshore;
2. Hydrogen and hydrolysis processes;
3. EBI Safety; and,
4. Definition of processes related to the EBI design parameters and their assessment.

The document comprises 4 sections, including:

- **Section 1: Introduction and Background.**
- **Section 2: Clarifications** provides clarifications in relation to the points raised above.
- **Section 3: Energy Balancing Infrastructure (EBI)** which defines EBI as per the Project Description and DCO.
- **Section 4: Environmental Impact Assessment (EIA)** signposts where the EBI has been assessed within the Environmental Statement (ES).

To aid navigation and signposting, **Blue bold text** is a cross-reference to the DCO Application documents (except for 1st level document headings). **Black bold text** is a cross reference to this document. Underlined black text is clarification provided by the Applicant herein.

2 Clarifications

The terms EBI and OnSS are used interchangeably on occasions throughout the DCO Application documents. The Applicant confirms that the EBI is part of the OnSS and not separate and discrete from the OnSS, as presented in the [D1.4.2: Works Plan – Onshore](#) and [Figure 4.23](#) of [A1.4 Project Description](#) (see [Figure 1](#)).

This section provides clarification to hydrogen within the EBI and the location of the EBI offshore

2.1.1 Hydrogen

[Paragraph 4.5.6.2](#) of [A1.4](#) states that *“EBI will comprise any (or a combination of) the following: energy storage technology such as batteries or a more suitable alternative, energy conversion technology such as power converters, hydrogen electrolysis, plus associated pipework, storage vessels and control systems, balance of plant equipment such as transformers and switchgear and cables to connect it to the substation”*.

The Applicant would like to clarify that the inclusion of “hydrogen electrolysis, plus associated pipework, storage vessels” has been included in the definition of EBI in error and should be deleted. Although “hydrogen electrolysis, plus associated pipework, storage vessels” was considered a viable technology to include during the early stages of drafting the Project Description the Applicant did not intend to include hydrogen electrolysis within the final definition of EBI.

[Table 5.5](#): Relevant risks pertaining to major accidents for Hornsea Four of [A1.5](#) states *“Hazards at the OnSS potentially include oil insulated circuit breakers, transformers, generators and infrastructure associated with the EBI such as hydrogen”*. The Applicant would like to clarify that the inclusion of hydrogen has been included in error and should be deleted. Although hydrogen was considered a viable technology to include during the early stages of drafting the Project Description the Applicant did not intend to include hydrogen within the final definition of EBI.

2.1.2 Offshore

[Paragraph 4.5.6.2](#) of [A1.4](#) states *“...If onshore, ...”*. This could be interpreted that the EBI is onshore or offshore..”. The Applicant has included reference to the offshore substations in error. [Figure 4.23](#) is an indicative figure of the onshore HVDC converter substation layout with the EBI (North-West) only. The Applicant did not intend to include reference to the location of EBI offshore and this reference should be deleted. The Applicant confirms that this is legacy text and that the powers being sought within our DCO are for onshore EBI only.

[Paragraph 4.5.6.2](#) of [A1.4](#) states *“.....All energy balancing equipment will be housed wholly within the footprint of the onshore or offshore substations....”*. The Applicant has included reference to the offshore substations in error. [Figure 4.23](#) is an indicative figure of the onshore HVDC converter substation layout with the EBI (North-West) only. The Applicant did not intend to include reference to the location of EBI offshore and this reference should be deleted. The Applicant confirms that this is legacy text and that the powers being sought within our DCO are for onshore EBI only.

3 Energy Balancing Infrastructure (EBI)

This section defines EBI for the purpose of clarity and to aid signposting.

3.1 Development Consent Order (DCO)

The EBI associated with Hornsea Four is wholly located within and as part of [Work No. 7 Part 1 of Schedule 1 in C1.1 DCO including the Draft DML](#)

“Work No. 7— connection works consisting of—

- (a) an onshore HVDC/HVAC substation;*
- (b) an energy balancing infrastructure;*
- (c) up to six cable circuits and electrical circuit ducts;*
- (d) vehicular access tracks and footpaths;*
- (e) a water attenuation feature;*
- (f) landscaping; and*
- (g) onshore construction works;”*

The spatial extent of Works No 7 is presented in **Figure 1** (extracted from [D1.4.2: Works Plan - Onshore](#)).

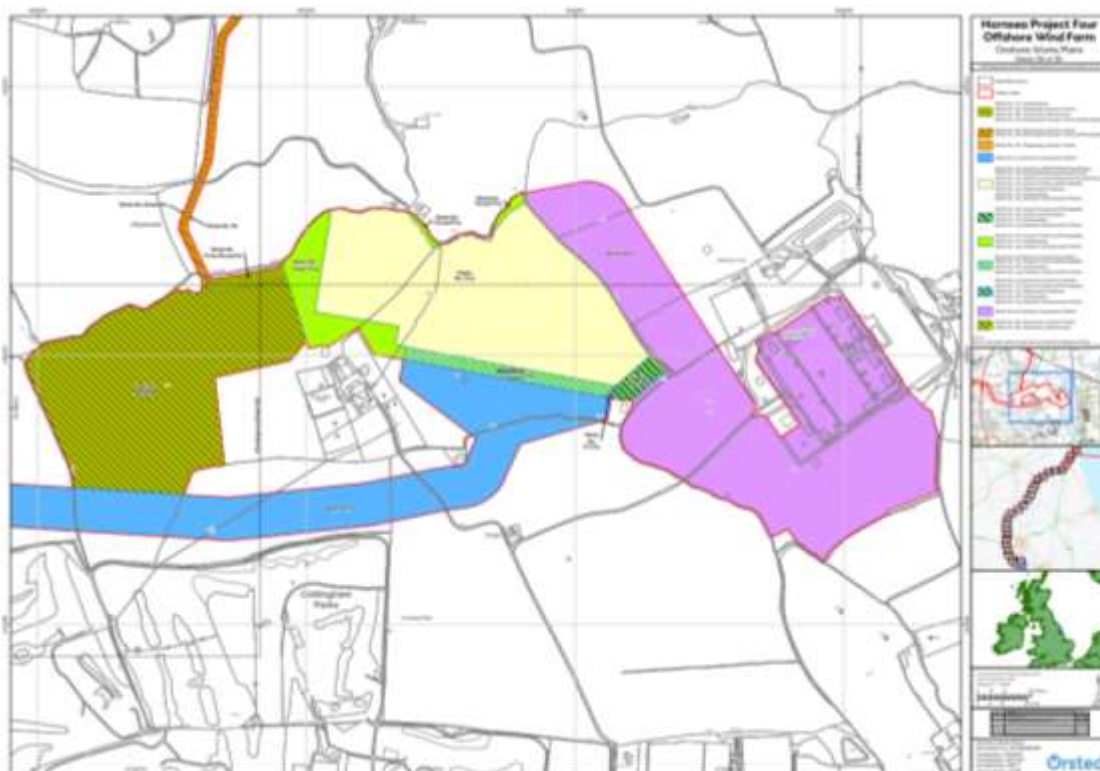


Figure 1. Extract from D1.4.2: Works Plan – Onshore illustrating spatial extent of onshore works at the Onshore substation.

3.2 Project Description

The EBI is summarised in [Section 4.5.6](#) of [A1.4: Project Description](#). The maximum design parameters (maximum design scenario (MDS)) for the EBI are specified in [Table 4.41](#) of [A1.4](#).

[Paragraph 4.5.6.2](#) of [A1.4](#) states “EBI will comprise of any (or a combination of) the following: energy storage technology such as batteries or a more suitable alternative, energy conversion technology such as power converters, hydrogen electrolysis, plus associated pipework, storage vessels and control systems, balance of plant equipment such as transformers and switchgear and cables to connect it to the substation. If onshore, it may be constructed in 2 parts on either side of the substation to maximise availability by ensuring one part is always running even if the other is undergoing maintenance, with the exact configuration determined post-consent”.

[Paragraph 4.5.6.3](#) of [A1.4](#) states “EBI is proposed to be housed in single or multiple building(s), several containers, in an open yard or a combination of the above. All energy balancing equipment will be housed wholly within the footprint of the onshore or offshore substations.. The final design of the EBI will be agreed in writing with East Riding of Yorkshire Council (ERYC) as set out in F2.13: Outline Design Plan”.

[Paragraph 4.10.3.2](#) states “Hornsea Four includes up to two separate EBI plants. The EBI plant layout is common for HVAC and HVDC solutions. Each plant consists of:

- Energy storage building(s);
- Transformers and converter area;
- Switchgear and control room building(s);
- Energy Balancing Equipment building(s);
- Connection of EBI Plant to the OnSS or alternatively directly to NGET Creyke Beck substation;
- Required access (utilising the same access road off the A1079 as the OnSS) and internal roads, drainage systems, perimeter and internal fences; and
- Required external lighting and lightning pylons.”

The MDS for EBI is specified in [Table 4.41](#) of [A1.4](#) (not repeated herein) and presented visually in [Figure 2](#). [Section 4.1](#) provides clarification on specific parts of the MDS pertinent to this signposting document.

[Figure 2](#) ([Figure 4.23](#) in [A1.4: Project Description](#)) presents the indicative 3D view of Onshore HVDC converter substation layout with the Energy Balancing Infrastructure (North-West) and Attenuation Feature in blue to the (South-East). This presents the MDS for the EBI and OnSS which forms the basis of the EIA to support the Hornsea Four DCO. Please see [Section 4](#) for detail.

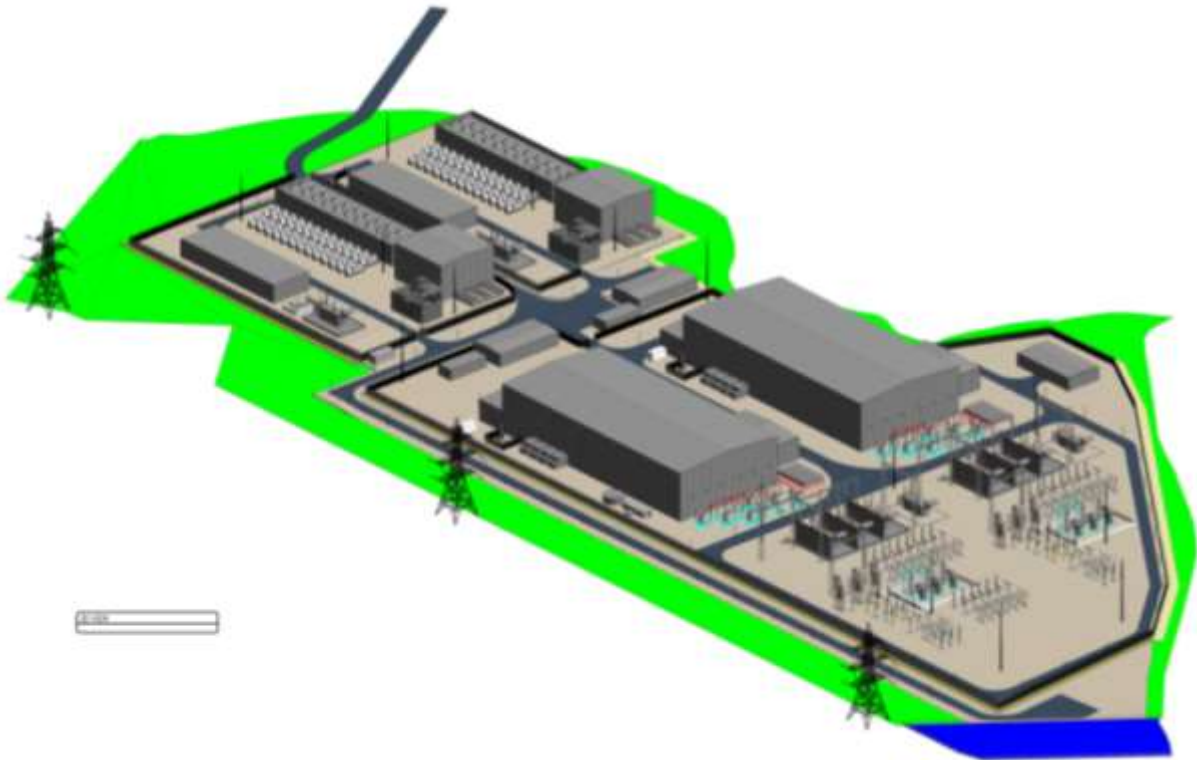


Figure 2 3D model of the Hornsea Four OnSS and EBI.

3.2.1 EBI and Onshore Substation (OnSS) terminology

The Applicant notes that the terms EBI and OnSS are used interchangeably throughout the Environmental Impact Assessment (EIA) and DCO documents for Hornsea Four. This is exemplified in [A1.4: Project Description](#):

- [Paragraph 4.6.1.5](#) which states *"Hornsea Four is also applying for Energy Balancing Infrastructure (EBI) in relation to the onshore or offshore HVDC converter or HVAC substations...." ...*
- [Paragraph 4.10.2.3](#) further states *"... The indicative site layouts and figures included in this chapter are based on an OnSS with two EBI Plants...."*
- [Paragraph 4.10.3.1](#) states *"The EBI is constructed within the OnSS site...."*

3.2.2 OnSS and EBI Design

[F2.13: Outline Design Plan](#), submitted to accompany the DCO application submission, sets out the outline details of the infrastructure design, secured by [Requirement 7 of Part 3 Schedule 1 within the C1.1: DCO Including Draft DML](#). The plan sets out the approach to design and aligns both the

OnSS and EBI within the same permanent works area. As stated above, this document shows the indicative placement of the EBI within the permanent works area inclusive of annotations (noting that the placement of buildings within the OnSS are also indicative at this time), as per **Figure 2**.

3.2.3 Hydrogen

A1.4: Project Description refers to hydrogen on two occasions. Once in relation to the role of offshore wind and its role in decarbonising other sectors (**paragraph 4.5.6.1**). No further signposting is deemed necessary.

The other reference is in **paragraph 4.5.6.2** which states “.... hydrogen electrolysis, plus associated pipework, storage vessels”. Please see **Section 2** and **Section 4** of this document.

It is also noted that **A1.5: Environmental impact Assessment Methodology** states “Hazards at the OnSS potentially include oil insulated circuit breakers, transformers, generators and infrastructure associated with the EBI such as hydrogen”. Please see **Section 2** and **Section 4** of this document.

3.2.4 Offshore

Paragraph 4.5.6.2 of **A1.4** states “.....All energy balancing equipment will be housed wholly within the footprint of the onshore or offshore substations....”. Please see **Section 2** and **Section 4** of this document.

3.2.5 EBI Safety

See EBI Safety in Section 4.3 of this document.

3.2.6 Definition of processes related to the EBI design parameters and their assessment

See Section 4 of this document.

4 Environmental Impact Assessment (EIA)

Work no. 7, inclusive of the onshore HVDC/HVAC substation (OnSS) and EBI as set out in [Part 1 Schedule 1 of the C1.1: DCO Including Draft DML](#) is the part of the Authorised Development assessed in the onshore Environmental Impact Assessment (EIA) and relevant outline plans and strategy documents as set out in [Volume F2](#) of the Hornsea Four DCO application submission.

4.1 Maximum Design Scenario (MDS) for EBI to inform EIA

The MDS used to inform the EIA for each onshore topic are set out in Section.9 of each onshore ES chapters (in [Volume A3](#)). Furthermore, the MDS for all impact assessments (inclusive of impacts 'Not considered further in the EIA') is set out in [A4.5.1: Impacts Register](#) within the column entitled 'Maximum Design Scenario (MDS)'.

For impact assessments not reliant on specific above ground parameters or details regarding emissions or processes, the following MDS is typically used:

- Permanent infrastructure area: 164,000 m²;
- Construction duration: 43 months;
- Temporary works area: 130,000 m²; and
- Foundations: 500 pre-cast or Continuous Flight Auger piles.

Examples of these can be found in [A3.1: Geology and Ground Conditions](#) and [A3.2: Hydrology and Flood Risk](#).

Where specific information regarding above ground infrastructure associated with work No. 7 were required to inform the EIA, MDS in accordance with the established principles of the Rochdale Envelope have been used. This MDS for EBI is specified in [Table 4.41](#) of [A1.4](#) (not repeated herein) and presented visually in [Figure 2](#). This represents the maximum parameters associated with the OnSS and EBI to ensure a robust assessment is undertaken.

An example can be found in [A3.4: Landscape and Visual Assessment](#).

Where detail regarding emissions or processes was required over and above the infrastructure parameters (principally noise (see impact ID NV-O-8 in [A3.6: Noise and Vibration](#) and accompanying tab in [A4.5.1: Impacts Register](#) by way of an example)), battery storage was been used as an established technology for the purposes of assessment.

OnSS:

- Main Buildings: Number: 2, Length: 240 m (if single building), Width: 80 m (if single building), Height: 25 m;
- Secondary Buildings: Number: 15, Total Combined Area: 7,000 m², Height: 15 m;
- Height of fire walls: 25 m; and
- Height of lightning protection for main building: 30 m.

OnSS Operational Noise:

- Variable Shunt Reactor: Number: 12, Noise Level: 97dB(A);
- Fixed Shunt Reactor: Number: 4, Noise Level: 93dB(A);
- DRC: Number: 6, Noise Level: 93dB(A);
- DRC Transformer: Number: 6, Noise Level: 91dB(A);
- DRC Reactor: Number: 6, Noise Level: 84dB);
- Super Grid Transformer: Number: 6, Noise Level: 95dB(A); and
- Harmonic Filter: Number:4, Noise Level: 91dB(A).

EBI:

- Main and Secondary Buildings: Total Area (within permanent infrastructure area): 17,300 m²;
- Main buildings: Height: 15 m;
- Secondary buildings: Height: 20 m (type one);
- Height of fire walls: 25 m;
- Lightning protection: Height: 25 m; and
- Minimum landscape treatment.

EBI Operational Noise:

- MV/LV Transformers: Number:100, Noise Level: 65dB(A);
- Power Converters: Number: 100, Noise Level: 85dB(A);
- Battery Area: Noise Level: 84dB(A); and
- Central AC Units: Number: 2, Noise Level: 80dB(A).

Table 4.42: HGV movements during construction and **Table 4.56: Sources and Noise Levels for the OnSS and EBI** of **A1.4: Project Description** provide the necessary process and/or emissions that form the basis of the EIA for the EBI within the relevant ES Chapter(s).

As stated in **paragraph 4.10.2.3** of **A1.4: Project Description**, “The indicative site layouts and figures included in this chapter are based on an OnSS with two EBI Plants. The final design would be optimised to mitigate spatial, visual and noise impact and any unused land would be released back to the landowners.” Further detail regarding the indicative layouts is presented in **F2.13: Outline Design Plan**, notably **Figure 2** and **Figure 3**, which shows the location of the EBI within the area assigned to work No. 7 with annotations for each key infrastructure.

In respect of construction, it is noted that **paragraph 4.10.3.5** of **A1.4: Project Description** states that “The EBI is constructed within the OnSS site and will be constructed within the same time line and will use the same access and temporary works layouts as the OnSS construction.” Physical construction works have as such been assessed in combination as the two aspects of works No. 7 will be constructed simultaneously within the same permanent works area. Similarly, traffic movements assessed combine movements for both the onshore substation and EBI.

4.2 Onshore EIA summary

Table 1 provides a summary of EBI assessment presented within the Onshore ES to which the reader is directed.

Table 1. Summary of EBI assessment presented within the Onshore ES.

Onshore Topic Area	EBI Assessment
A3.1 Geology and Ground Conditions	Assessed as part of the OnSS, within the overall permanent infrastructure footprint. Necessary mitigation measures secured within plans and strategy documents in Volume F2 (such as the F2.2 Outline Code of Construction Practice).
A3.2 Hydrology and Flood Risk	Assessed as part of the OnSS, within the overall permanent infrastructure footprint. Necessary mitigation measures secured within plans and strategy documents in Volume F2 (such as the F2.2 Outline Code of Construction Practice).
A3.3 Ecology and Nature Conservation	EBI is included within the assessment of the OnSS, paragraph 3.5.1.2 states that for the purpose of the assessment, the OnSS site study area includes “ <i>permanent and temporary storage areas, EBI and 400 kV NGET connection area.</i> ” The MDS for relevant impacts assessments specifies “ <i>Energy balancing Infrastructure</i> ” (see Table 3.15 and the accompanying Impacts Register tab).
A3.4 Landscape and Visual	<p>EBI is included within the assessment of the OnSS, “<i>Energy Balancing infrastructure</i>” is included within the MDS (see Table 4.12 and accompanying Impacts Register tab). Building numbers, total floor area and heights are specified for the EBI and OnSS. Furthermore, the MDS states that “<i>The infrastructure has been placed in the most sensitive parts of the landscape to provide the maximum design scenario.</i>”</p> <p>Photomontages and Wireframes (see A6.4.1: Landscape and visual Resources Wireframes and Photomontages) show both the indicative OnSS and EBI design (photomontages), in addition to wireframes that show both the 15 m height of EBI infrastructure across the entire site and placement of the tallest EBI buildings (20 m) in the most sensitive locations. This accounts for the MDS for landscape and visual purposes.</p>
A3.5 Historic Environment	EBI is included within the assessment of the OnSS, paragraph 5.5.1.2 states that the EBI is incorporated within the OnSS boundary for the purposes of the study area, “ <i>Energy Balancing infrastructure</i> ” is included within the MDS (see Table 5.8 and accompanying Impacts Register tab).
A3.6 Land Use and Agriculture	EBI is included within the assessment of the OnSS, paragraph 6.5.1.1 states that the EBI is incorporated within the OnSS boundary for the purposes of the study area, “ <i>Energy Balancing infrastructure</i> ” is included within the MDS (see Table 6.14 and accompanying Impacts Register tab).
A3.7 Traffic and Transport	EBI is included within the assessment of the OnSS, “ <i>Energy Balancing infrastructure</i> ” is included within the MDS, combined with OnSS traffic movements (in addition to other project elements within the wider traffic and transport study area (see Table 7.13 and accompanying Impacts Register tab). The incorporation of EBI traffic numbers is further referenced in paragraph 4.10.3.6 of A1.4: Project Description .

	In respect of operational traffic, paragraph 4.11.3.3 in A1.4: Project Description sets out the number of operational traffic movements anticipated for both the OnSS and EBI.
A3.8 Noise and Vibration	EBI is included within the assessment of the OnSS, “ <i>Energy Balancing infrastructure</i> ” is included within the MDS (see Table 8.18 and accompanying Impacts Register tab). Specific noise sources have been identified for both the OnSS and EBI and inputted into the noise model, which has informed necessary mitigation measures to accordance with Commitment 159, which limits Operational noise to be at a noise level no greater than 5dB above the representative background (LA90,T) during the day time and night at the identified noise Sensitive Receptors. This commitment is secured by DCO requirement 21 (Control of noise during operational phase), which is relevant to all aspects of work no. 7 (inclusive of EBI).
A3.9 Air Quality	EBI is included within the assessment of the OnSS, “ <i>Energy Balancing infrastructure</i> ” is included within the MDS (see Table 9.11 and accompanying Impacts Register tab). No operational emissions to air are anticipated and as such, impact assessment has not been undertaken (scoped out as per agreement achieved during EIA Scoping, impact ID AQ-O-4).
A3.10 Socio-economic	Incorporated within the overall assessment of Hornsea Four – individual project elements are not specified or relevant.

As presented in [Table 1](#) and [Section 4.1](#), the assessment presented within the ES assesses the MDS for both “enclosed” and “open yard” approaches to EBI design and configuration.

4.3 EBI Safety

It is noted that assessment of Major Accidents and Disaster was scoped out of the EIA at the point of EIA Scoping. Detail in respect of fire risk at the OnSS (including EBI) is included within [Table 5.5](#) of [A1.5: Environmental Impact Assessment Methodology](#). Furthermore, the Applicant has submitted [F2.12: Outline Energy Balancing Infrastructure HazID Report](#), which sets out the fundamental design measures and processes to be deployed to mitigate hazard risk within the EBI. This document was included within the DCO application submission as precedent was established during the Cleve Hill Solar Park examination.

The HazID Report specifies that “*the Applicant will actively engage the chosen technology provider and the local Fire and Rescue Service to develop a fire management strategy*”. It is stated (see [Section 4.4](#) of the report) that the hierarchy of control eliminates risk through design as far as possible, such as “*to remove the need for firefighters to enter the site by allowing for control to be managed remotely*”. The outline report will form the basis of a detailed report, to be approved by the relevant planning authority, secured by [Requirement 26 Part 3 Schedule 1 of C1.1: DCO Including Draft DML](#).