Department for Energy Security & Net Zero

Offshore Carbon Dioxide Storage Licensing Round

Marine Conservation Zone/Marine Protected Area Assessment

May 2023

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1 Introduction

1.1 Background and overview of plan

The North Sea Transition Authority (NSTA) launched a carbon storage licensing round (also termed the 1st carbon dioxide storage licensing round) on 14th June 2022 and invited applications for a number of offshore areas in the northern North Sea, central North Sea, southern North Sea and eastern Irish Sea. The licensing round closed on 13th September 2022 with applications being made covering all or part of the 13 areas offered.

The plan/programme covering the launch of this carbon storage licensing round was subject to a Strategic Environmental Assessment (OESEA3), completed in July 2016. The SEA Environmental Report includes detailed consideration of the status of the natural environment and potential effects of the range of activities which could follow licensing, including potential effects on conservation sites. The SEA Environmental Report was subject to public consultation following which a post-consultation report was produced which summarised the comments received and provided further clarifications which has enabled the decision to adopt the plan/programme. BEIS (2018) documents a review of the OESEA3 Environmental Report undertaken to assess the continued currency of the SEA information base, its conclusions and recommendations and suitability to underpin continued leasing and licensing in relevant UK waters. The most recent SEA (OESEA4) undertaken in 2022 also covered future licensing for offshore carbon dioxide storage. Public consultation on the OESEA4 Environmental Report concluded on 27th May 2022 and the Government Response was published in September 2022, at which time the new plan/programme was adopted.

1.2 Licensing

The *Energy Act 2008* (the Act) established a licensing regime for the storage of carbon dioxide in a controlled place including areas within UK territorial seas, and in areas beyond those waters which have been designated as the Exclusive Economic Zone (EEZ), formerly the Gas Importation and Storage Zone (GISZ). The Act prohibits the storage of carbon dioxide (with a view to its permanent disposal) except in accordance with a licence granted under the Act. The Oil & Gas Authority (OGA, now operating as NSTA) is the licensing authority responsible for granting licences and storage permits. In addition to a licence, a lease from The Crown Estate is required for carbon dioxide storage related activities. Following the grant of any lease/licence, offshore activities are subject to a range of statutory permitting and consenting requirements.

Carbon dioxide storage licences contain three terms covering exploration and appraisal (Appraisal or Initial Term[1]), operation, and post-closure. The appraisal term includes a work programme which may cover the drilling of appraisal wells, seismic survey, and other work such as geotechnical and geophysical studies. The length of the initial/appraisal term is not defined in regulations other than it is not to exceed "*…the period necessary to (a) generate the information necessary to select a storage site, and (b) prepare the documents required for an application under regulation 6*" (storage permit); recent applications have had appraisal terms

[1] The name 'appraisal term' applies where there is a work programme in place, when there is no such work programme it is termed the 'initial term'. This assessment covers both appraisal or initial terms.

of between four and eight years. The initial/appraisal term may be extended under conditions laid down in the licence, but will expire if no permit application is made to the NSTA by the date of its expiry or if a permit application is refused. This assessment only considers the exploration/appraisal term.

1.3 Document purpose

The Marine and Coastal Access Act 2009 (as amended) (MCAA) and the *Marine (Scotland) Act 2010* (as amended) (M(S)A) contain general duties for public authorities (in this case the Department for Energy Security and Net Zero, hereafter, the Department[2]) in relation to the protection of Marine Conservation Zones (MCZ) and Marine Protected Areas (MPA)[3] respectively. Sections 125 and 82 respectively of the above Acts apply to public authorities which have any function, the exercise of which is capable of affecting (other than insignificantly):

- the protected features of an MCZ/MPA;
- any ecological or geomorphological process on which the conservation of any protected feature of an MCZ/MPA is (wholly or in part) dependent.

Where it is considered that the exercise of a function would or might significantly hinder the achievement of the conservation objectives for an MCZ or MPA, the public authority must inform the appropriate statutory conservation bodies, which in Scotland also includes, where appropriate, Historic Environment Scotland[4] and the Scottish Ministers.

This assessment has been undertaken by the Department to ascertain whether its function in agreeing to the licensing of areas for carbon dioxide storage is capable of affecting any MCZ or MPA, and if so, whether the effect would be significant, and whether this would hinder the achievement of site conservation objectives.

[2] Note that while the NSTA grant licences, the Department retains environmental regulatory functions which are administered by the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED). These include, in particular, functions under *The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001*, including the giving of agreement (on behalf of the Secretary of State) to the grant by the NSTA of carbon dioxide storage licences. This assessment therefore proceeds on the basis that the Department is a public authority that should consider the potential for effects on MPAs and MCZs under section 125 of the *Marine and Coastal Access Act 2009* and section 82 of the *Marine (Scotland) Act 2010*.

[3] In Scottish waters, this includes MPAs created for nature conservation, demonstration and research, or to protect historic assets.

[4] All current historic MPAs in Scottish waters are located entirely within territorial waters where carbon dioxide licensing is devolved to Scottish Ministers.

2 Areas applied for, potential activities and relevant sites

2.1 Areas applied for

All 13 areas offered in the 1st carbon storage licensing round were applied for and are shown on Figure 2.1 to Figure 2.3. All these areas are considered in this assessment.

2.2 Nature and likely scale of activity

As this is the first carbon dioxide storage licensing round, it is not possible to gauge the potential for any of the areas to proceed to the storage permit application stage (and thereafter development) based on previous experience. Licensees that fulfil the Appraisal/Initial Terms and progress to applying for a storage permit may require further drilling, installation of infrastructure such as wellheads, pipelines, and possibly fixed platform injection facilities. The nature, extent and timescale of such developments, if any, which may ultimately result from the licensing of the areas is uncertain, and therefore it is regarded that currently a meaningful assessment of development level activity cannot be made; this will be undertaken at the project specific level.

Completion of the exploration/appraisal work programmes is likely to involve one or more of the activities summarised in Table 2.1. A series of assumptions has been developed on the nature and scale of activities to be assessed which have been informed by an evidence base for potential effects in OESEA4 (BEIS 2022a) and the recent HRA exercise for the 1st carbon dioxide storage licensing round (BEIS 2022b).

While this assessment considers potential activities which may follow licensing, the licence grants exclusive rights to the holders to undertake exploration and appraisal activities to evaluate the potential of the licensed area for carbon dioxide storage, and does not constitute any form of approval for activities to take place within that area, nor does it confer any exemption from other legal or regulatory requirements. Offshore activities are subject to a range of statutory permitting and consenting requirements, and activities will be subject to further assessment as part of consenting decisions.

Table 2.1: Indicative overview of potential activities that could arise during the appraisal term

Potential activity	Description	Assumptions used for assessment
Geophysical survey		
Seismic (2D and 3D) survey	2D seismic involves a survey vessel with an airgun array and a towed hydrophone streamer (up to 12 km long), containing several hydrophones along its length. The reflections from the subsurface strata provide an image in two dimensions (horizontal and vertical). Repeated parallel lines are typically run at intervals of several kilometres (minimum *ca*. 0.5km) and a second set of lines at right angles to the first to form a grid pattern. This allows imaging and interpretation of geological structures and identification of potential geological structures suitable for carbon dioxide storage. 3D seismic survey is similar but uses several hydrophone streamers towed by the survey vessel. Thus closely spaced 2D lines (typically between 25 and 75m apart) can be achieved by a single sail line.	These deep-geological surveys tend to cover large areas (300-3,000km^2) and may take from several days up to several weeks to complete. Typically, large airgun arrays are employed with 12-48 airguns and a total array volume of 3,000-8,000 in^3. From available information across the UKCS, arrays used on 2D and 3D seismic surveys produce most energy at frequencies below 200Hz, typically peaking at 100Hz, and with a peak broadband source level of around 256dB re 1µPa @ 1m (Stone 2015). While higher frequency noise will also be produced which is considerably higher than background levels, these elements will rapidly attenuate with distance from source; it is the components <1,000Hz which propagate most widely.
Rig site survey	Rig site surveys are undertaken to identify seabed and subsurface hazards to drilling, such as wrecks and the presence of shallow gas. The surveys use a range of techniques, including multibeam and side scan sonar, sub-bottom profiler, magnetometer and high-resolution seismic involving a much smaller source (mini-gun or four airgun cluster of 160 in^3) and a much shorter hydrophone streamer. Arrays used on site surveys and some Vertical Seismic Profiling (VSP) operations (see below) typically produce frequencies predominantly up to around 250Hz, with a peak source level of around 235dB re 1µPa @ 1m (Stone 2015). Studies (Crocker & Fratantonio 2016, Halvorsen & Heaney 2018 (also see Labak 2019), Pace *et al.* 2021) have sought to understand the acoustic characteristics of example geophysical survey equipment types including through open water testing, which has provided a better understanding of the source levels, frequencies, and potential effects of using this equipment.	A rig site survey typically covers 2-3km^2. The rig site survey vessel may also be used to characterise seabed habitats, biota and background contamination. Survey durations are usually of the order of four or five days.
Drilling and well evaluation		
Rig tow out & de-mobilisation	Mobile rigs are towed to and from the well site typically by 2-3 anchor handling vessels.	The physical presence of a rig and related tugs during tow in/out is both short (a number of days depending on initial location of rig) and transient.
Rig placement/ anchoring	Semi-submersible rigs are used in deeper waters (normally >120m). Mooring is achieved using either anchors (deployed and recovered by anchor handler vessels) or dynamic positioning (DP) to	Semi-submersible rig anchors (if used) may extend out to a radius of 1.5-1.8km in North Sea waters of the UK. An ES for an exploration well in Block 18/05 in *ca*. 90m water depth estimated

Potential activity	Description	Assumptions used for assessment
	manoeuvre into and stay in position over the well location. Eight to 12 anchors attached to the rig by cable or chain are deployed radially from the rig; part of the anchoring hold is provided by a proportion of the cables or chains lying on the seabed (catenary).	that the area of seabed affected by anchoring was *ca.* 0.01km^2 (Apache North Sea Limited 2006), and in deeper waters the seabed footprint may be in the order of 0.06km^2.
	Jack-up rigs are used in shallower waters (normally <120m) and jacking the rig legs to the seabed supports the drilling deck. Each of the rig legs terminates in a spud-can (base plate) to prevent excessive sinking into the seabed. Unlike semi-submersible rigs, jack-up rigs do not require anchors to maintain station, and these are not typically deployed for exploration activities, with positioning achieved using several tugs, with station being maintained by contact of the rig spudcans with the seabed. Anchors may be deployed to achieve precision siting over fixed installations or manifolds at injection facilities, which are not considered in this assessment.	It is assumed that jack-up rigs will be three or four-legged rigs with 20m diameter spudcans with an approximate seabed footprint of 0.001km^2 within a radius of *ca.* 50m of the rig centre. For the assessment it is assumed that effects may occur within 500m of a jack-up rig which would take account of any additional rig stabilisation (rock placement) footprint. A short review of 18 Environmental Statements[5], which included drilling operations in the southern North Sea since 2007 (specifically in quadrants 42, 43, 44, 47, 48, 49 and 53) indicated that rig stabilisation was either not considered necessary and/or assessed as a worst-case contingency option. Where figures were presented, the spatial scale of potential rock placement operations was estimated at between 0.001-0.004km^2 per rig siting. Mud mats are routinely used in offshore oil and gas, and offshore wind, infrastructure. In particular they tend to be used below templates and pipeline end manifolds to control vertical and lateral movements of the structures, and also on the footings of jacket-type structures to provide on-bottom stability prior to the installation of piles, particularly on soft sediments (Dunne & Martin 2017, IFC 2021, Shell 2022, Ørsted 2022). Mud mats are generally made from steel, and are used to distribute the weight of the overlying infrastructure but also control lateral movements (Dunne & Martin 2017). There is the potential to use mud mats for jack-up rig drilling (Stewart 2007) as an alternative to rock placement, though examples are fewer than for fixed infrastructure. Mud mats, if used, would be expected to be removed as part of the overall drilling programme, and would, therefore, represent only a temporary feature which would be permanently removed on completion of the work programme.
Marine discharges	Typically around 1,000 tonnes of cuttings (primarily rock chippings) result from drilling an exploration well. Water-based mud cuttings are	The distance from source within which smothering or other effects may be considered possible is generally a few hundred metres. For

[5] Note that this review was of oil and gas wells. Approaches to rig placement for carbon dioxide appraisal would be the same.

Potential activity	Description	Assumptions used for assessment
	typically discharged at, or relatively close to sea surface during "closed drilling" (i.e. when steel casing in the well bore and a riser to the rig are in place), whereas surface hole cuttings are normally discharged at seabed during "open-hole" drilling. Use of oil based mud systems, for example in highly deviated sections or in drilling water reactive shales, would require onshore disposal or treatment offshore to the required standards prior to discharge.	the assessment it is assumed that effects may occur within 500m of the well location covering an area in the order of 0.8km^2.
Conductor piling	Well surface holes are usually drilled "open-hole" with the conductor subsequently inserted and cemented in place to provide a stable hole through which the lower well sections are drilled. Where the nature of the seabed sediment and shallow geological formations are such that they would not support a stable open-hole (i.e. risking collapse), the conductor may be driven into the sediments. In North Sea exploration wells, the diameter of the conductor pipe is usually 26" or 30" (<1m), which is considerably smaller than the monopiles used for offshore wind farm foundations (>3.5m diameter), and therefore require less hammer energy and generate noise of a considerably lower amplitude. For example, hammer energies to set conductor pipes are in the order of 90-270kJ (see: Matthews 2014, Intermoor website), compared to energies of up to 3,000kJ in the installation of piles at some southern North Sea offshore wind farm sites. Direct measurements of underwater sound generated during conductor piling are limited. Jiang *et al.* (2015) monitored conductor piling operations at a jack-up rig in the central North Sea in 48m water depth and found peak sound pressure levels (L_{pk}) not to exceed 156dB re 1 µPa at 750m (the closest measurement to source) and declining with distance. Peak frequency was around 200Hz, dropping off rapidly above 1kHz; hammering was undertaken at a stable power level of 85 ±5 kJ but the pile diameter was not specified (Jiang *et al.* 2015). MacGillivray (2018) reported underwater noise measurements during the piling of six 26" conductors at a platform, six miles offshore of southern California in 365m water depth. After initially penetrating the seabed under its own weight, each conductor was driven approximately 40m further into the seabed (silty-clay and clayey-silt) with hammer energies that increased from 31 ±7 kJ per strike at the start of driving to 59 ±7 kJ per strike. Between 2.5-3 hours of active piling was required per conductor. Sound levels were recorded by fixed hydrophones positioned at distances of 10-1,475m	The need to pile conductors is well-specific and is not routine. It is anticipated that a conductor piling event would last between 4-6 hours, during which time impulses sound would be generated primarily in the range of 100-1,000Hz, with each impulse of a sound pressure level of approximately 150dB re 1µPa at 500m from the source.

Potential activity	Description	Assumptions used for assessment
	from the source and in water depths of 20-370m, and by a vessel-towed hydrophone. The majority of sound energy was between 100-1,000Hz, with peak sound levels around 400Hz. Broadband sound pressure levels recorded at 10m from source and 25m water depth were between 180-190dB re 1µPa (SEL = 173-176dB re 1µPa·s), reducing to 149-155dB re 1µPa at 400m from source and 20m water depth (SEL = 143-147dB re 1µPa·s).	
Rig/vessel presence and movement	On site, the rig is supported by supply and standby vessels, and helicopters are used for personnel transfer.	Supply vessels typically make 2-3 supply trips per week between rig and shore. Helicopter trips to transfer personnel to and from the rig are typically made several times a week. A review of Environmental Statements for exploratory drilling suggests that the rig could be on location for, on average, up to 10 weeks. Support and supply vessels (50-100m in length) are expected to have broadband source levels in the range 165-180dB re 1µPa@1m, with the majority of energy below 1kHz (OSPAR 2009). Additionally, the use of thrusters for dynamic positioning has been reported to result in increased sound generation (>10dB) when compared to the same vessel in transit (Rutenko & Ushchipovskii 2015).
Well evaluation (e.g. Vertical Seismic Profiling)	Sometimes conducted to assist with well evaluation by linking rock strata encountered in drilling to seismic survey data. A seismic source (airgun array, typically with a source size around 500 in^3 and with a maximum of 1,200 in^3, Stone 2015) is deployed from the rig, and measurements are made using a series of geophones deployed inside the wellbore.	VSP surveys are of short duration (one or two days at most).

2.3 Relevant sites

Sites were considered for inclusion/exclusion in the screening process based on whether there was an impact pathway[6] between the marine features for which they are designated and potential exploration/appraisal activities which could arise following licensing (see Table 2.1). Sites considered include relevant designated MCZs, nature conservation and historic MPAs, and pilot Highly Protected Marine Areas (HPMAs). The first three pilot HPMAs in English waters are due to be designated before 6th July 2023[7] and remain candidate sites until then. They are due to be designated as MCZs under the MCAA, and in keeping with MMO (2013) guidance (see Section 3.1), they are treated in this assessment as if they are already designated. All sites considered in this assessment are mapped in Figure 2.1 to Figure 2.3 and further details including their designation type and protected features are provided in Appendix A. The sources of site data include the JNCC[8], Natural England[9], NatureScot[10] and Historic Environment Scotland[11] websites.

[6] Based on knowledge of potential sources of effect resulting from the activities and pathways by which these effects may impact receptors present on the site (from previous Department SEAs, SNCB advice on operations and literature sources etc). Also refer to Section 4.2.
[7] The first three HPMAs in English waters are due to be designated before 6th July 2023: https://www.gov.uk/government/publications/highly-protected-marine-areas/highly-protected-marine-areas-hpmas
[8] https://jncc.gov.uk/our-work/marine-conservation-zones/
[9] https://designatedsites.naturalengland.org.uk/
[10] https://sitelink.nature.scot/home
[11] http://portal.historicenvironment.scot/

Figure 2.1: Areas applied for and relevant sites: northern and central North Sea

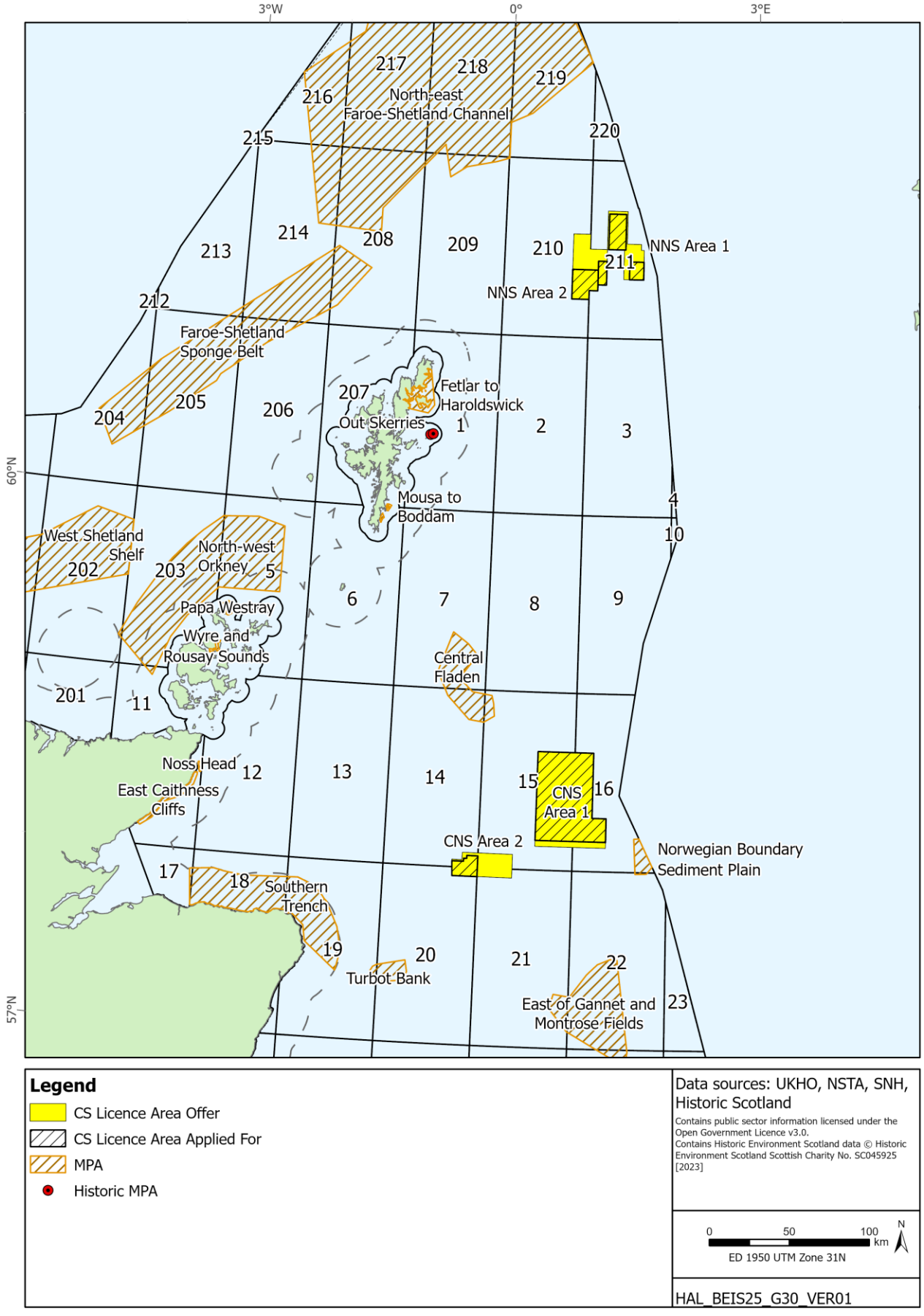


Figure 2.2: Areas offered and applied for, and relevant sites: southern North Sea

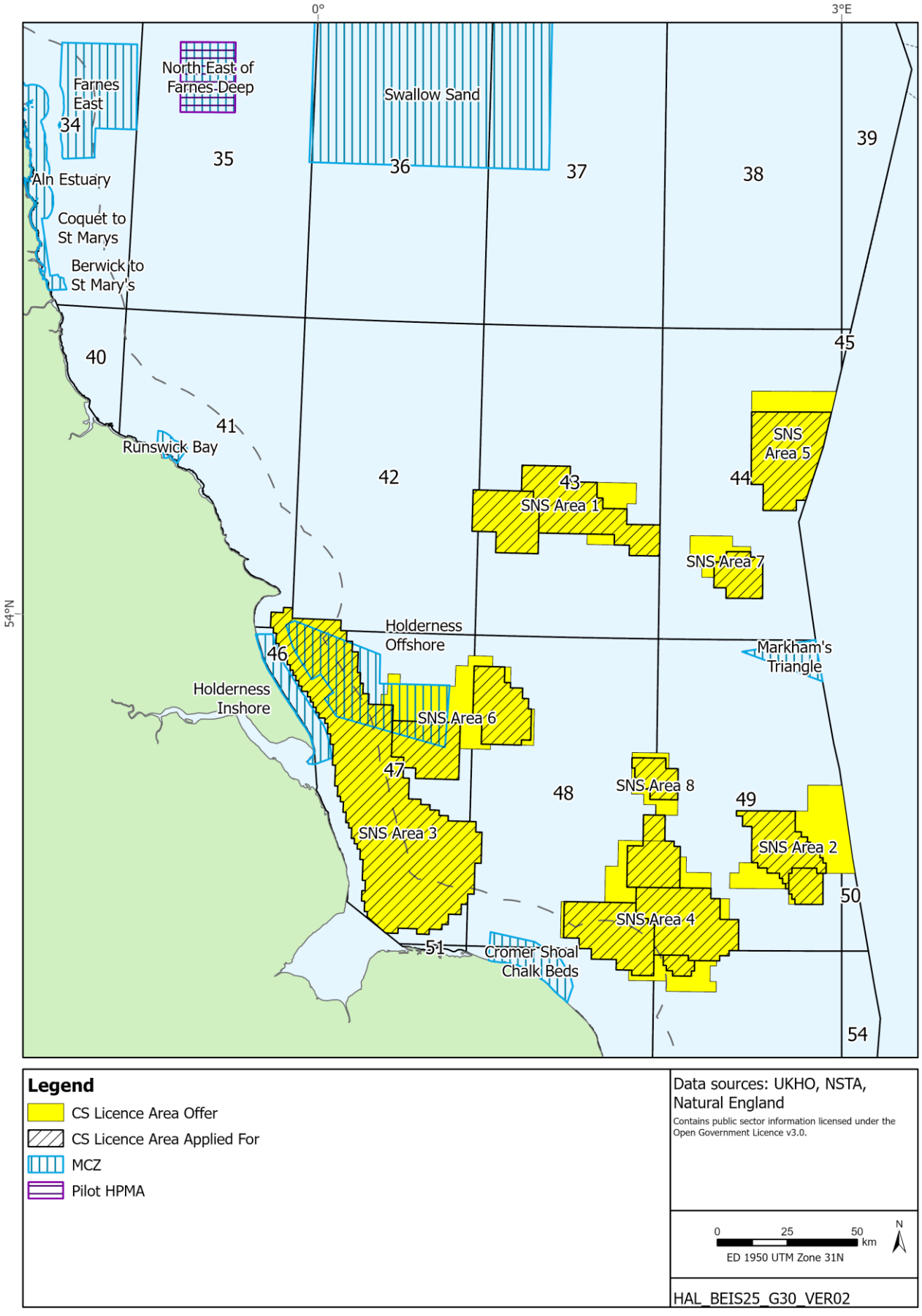
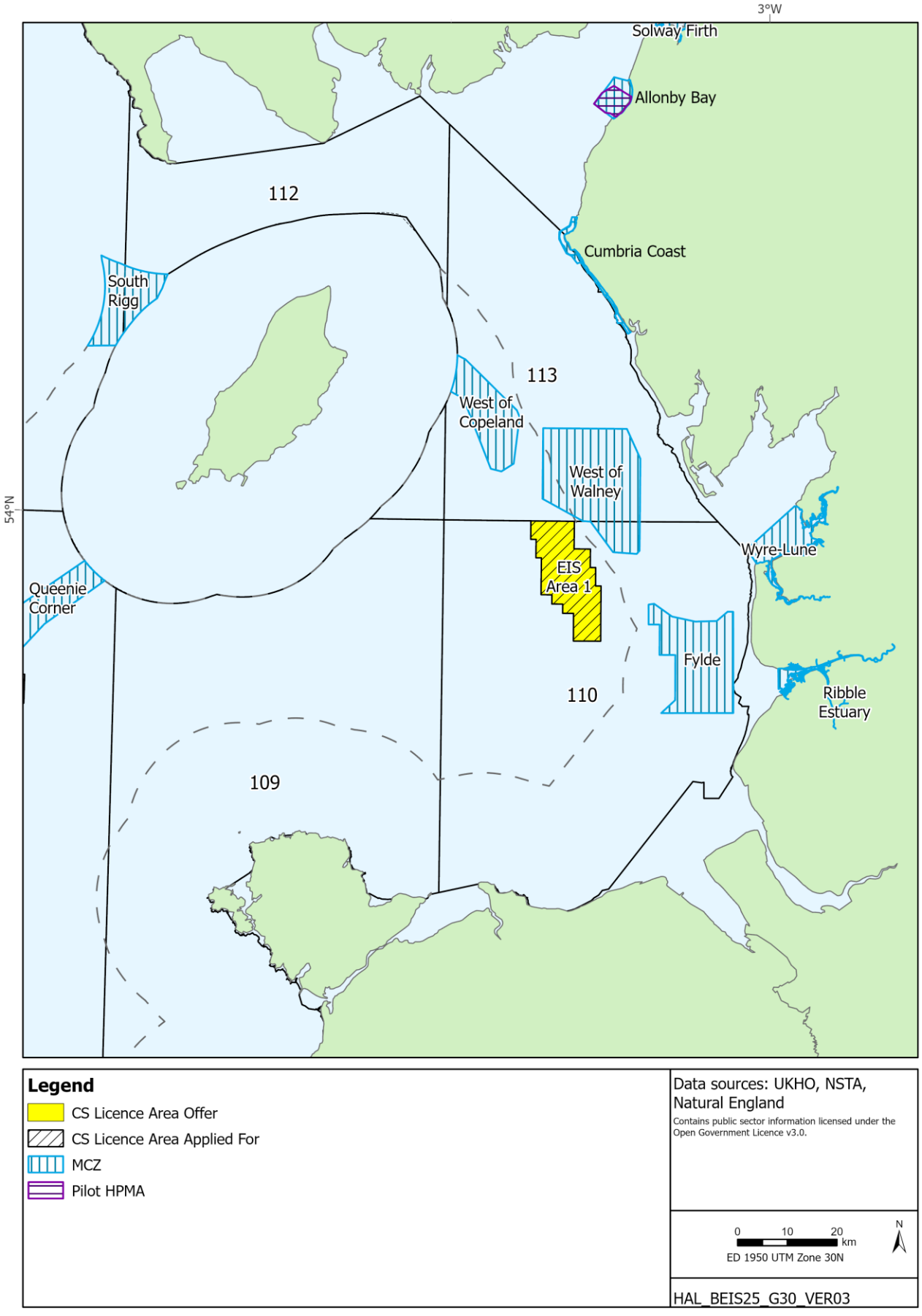


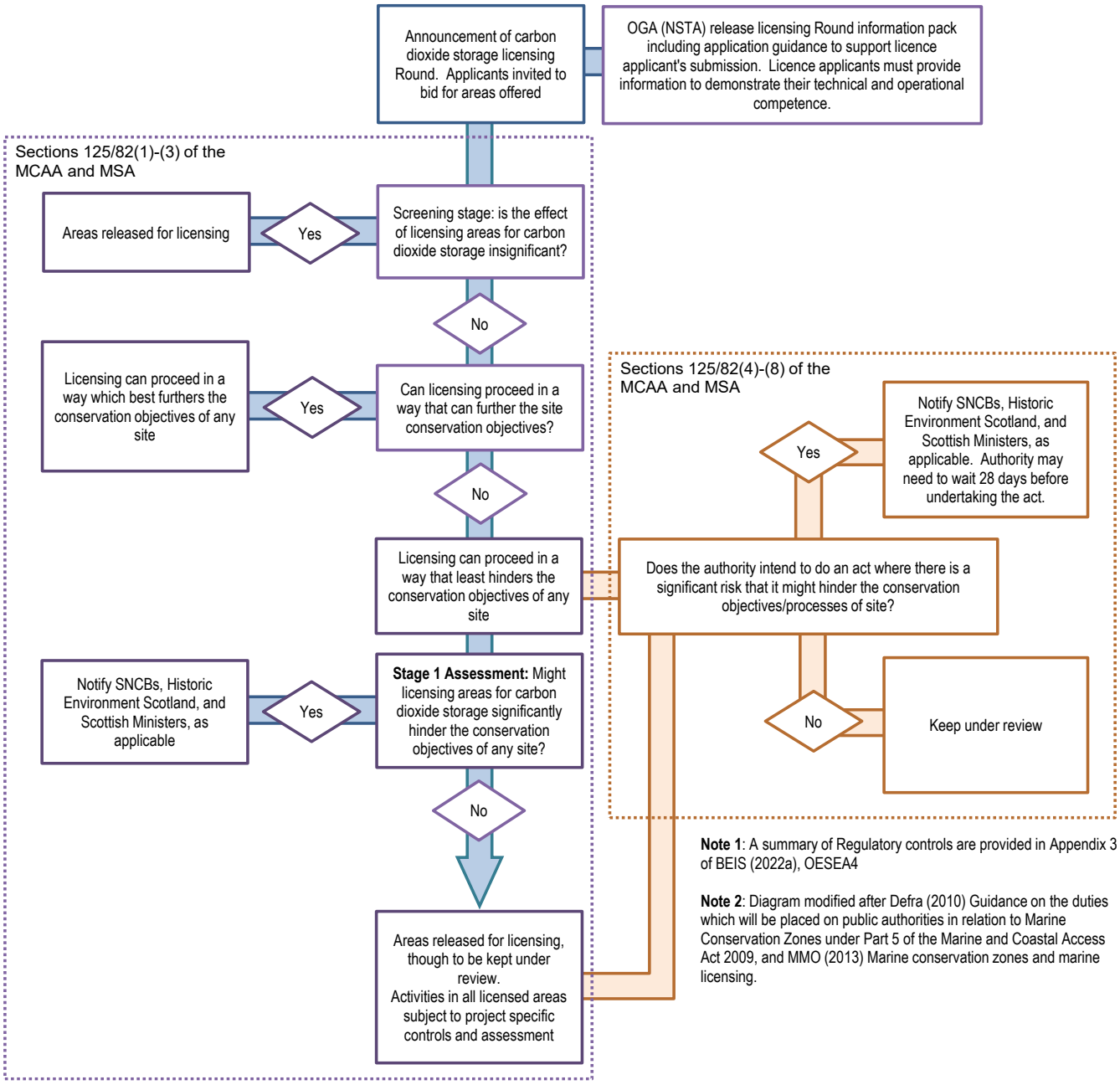
Figure 2.3: Areas offered and applied for, and relevant sites: eastern Irish Sea



3 Assessment Process

The assessment has considered available guidance on the assessment of MCZs/MPAs (Defra 2010, MMO 2013), however, in view of the stage at which the licensing decision is taken, Section 126 of the MCAA, to which MMO (2013) relates, would be relevant at the project level. In the absence of other guidance, this assessment takes account of the general framework provided in MMO (2013), Defra (2010), and the wording of Section 125 of the MCAA and 82 of the M(S)A. A high level overview of the MCZ/MPA assessment process modified after Defra (2010) and MMO (2013) is shown in Figure 3.1. Note that while Sections 125/82(4)-(8) of the Acts are covered in this diagram for completeness, they are not considered to apply to this assessment.

Figure 3.1: Stages of the MCZ/MPA assessment



Note 1: A summary of Regulatory controls are provided in Appendix 3 of BEIS (2022a), OESEA4

Note 2: Diagram modified after Defra (2010) Guidance on the duties which will be placed on public authorities in relation to Marine Conservation Zones under Part 5 of the Marine and Coastal Access Act 2009, and MMO (2013) Marine conservation zones and marine licensing.

3.1 Screening

The screening is intended to determine the sites and related carbon storage licensing areas applied for that should be subject to further "Stage 1" assessment (see Section 4). MMO (2013) provides the following tests to ascertain whether further assessment is required, modified here to account for Scottish sites, which are:

- the licensable activity is taking place within or near an area being put forward or already designated as an MCZ or MPA; and
- the activity is capable of affecting (other than insignificantly) either (i) the protected features of an MCZ or MPA; or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ or MPA is (wholly or in part) dependant[12].

The approach taken to assessment has been to:

- Define the likely location and nature of exploration/appraisal activities that could follow licensing (Section 2).
- Identify all relevant sites and their protected features with the potential to be affected by exploration/appraisal activities (i.e. those sites with marine features or with a marine ecological linkage) (Section 3).
- Screen the relevant sites based on their location relative to the areas applied for in the 1st carbon dioxide storage licensing round, and the potential for their features, or ecological and geomorphological processes, to be significantly affected (Section 4).
- For those sites which are screened in, undertake a "Stage 1" assessment (Section 5).

The screening is informed by an evidence base on the environmental effects of carbon dioxide storage appraisal related activities and analogous oil and gas activities derived from the scientific literature, and relevant Strategic Environmental Assessments (e.g. DECC 2009, 2011, 2016, BEIS 2022a). Particular use is made of the most recent Offshore Energy SEA (OESEA4), specifically Section 5, which covers a broader range of relevant effects, for example, those relating to the potential for physical damage effects on the historic environment, or the potential for effects on geomorphological processes. Additionally, the screening makes use of the information base presented in the Habitats Regulations Assessment (HRA) for the 1st Carbon Dioxide Storage Licensing Round (BEIS 2022b)[13], which is considered to be relevant to many aspects of this assessment, including relevant pressures identified in a review of the advice on operations/conservation management advice for the MCZ and nature conservation MPA site network. This evidence base allows for the identification of a set of distance-based screening criteria (Table 3.1). These can be taken to reflect what "near" means in relation to the first screening test in MMO (2013) for sites which do not overlap any of the areas applied for. Where sites are located within the screening

[12] This part is consistent with Section 125(1) of the *Marine and Coastal Access Act 2009* (as amended)
[13] https://www.gov.uk/guidance/offshore-energy-strategic-environmental-assessment-sea-an-overview-of-the-sea-process#appropriate-assessment

distances set out in Table 3.1, it is considered that activities would be capable of affecting (other than insignificantly) a site's features or functions and a Stage 1 assessment will be undertaken (Section 3.2).

A limited number of MCZ or MPA sites are designated for mobile species (marine mammals – also see Section 3.4.2, birds, and fish) which may be present beyond site boundaries. The following relevant mobile species are currently protected in relevant MCZs or MPAs:

- Minke whale
- Risso's dolphin
- Black guillemot
- Basking shark
- Flapper skate
- Blue ling
- Razorbill

As cetaceans are listed on Annex IV of the Habitats Directive, they are subject to separate protections beyond the boundaries of sites for which they are designated (including Special Areas of Conservation, see BEIS 2022b), and therefore protections for these species beyond the boundaries of MCZs or MPAs are similarly considered to be covered by the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended). On this basis, the screening criteria outlined below in relation to disturbance and noise are considered to be relevant.

While flapper skate is a protected feature of some Scottish MPAs, overall its range has significantly contracted across the wider North Sea and its distribution beyond the boundaries of any MPA are unknown; the screening criteria below are considered to be sufficient to identify relevant sites for which effects could be significant.

Basking shark sightings peak in summer, including in areas of the Minch, Isle of Man and Cornwall, but it is less clear where they spend their winter (see Appendix 1a.4 of BEIS 2022a). They have been recorded all around Scotland but are found in larger numbers in the Sea of the Hebrides MPA, the only site for which this species is designated as a feature. There is relatively limited understanding of the distribution of basking shark in the regions containing the areas applied for, and limited ability to attribute individual sightings in areas such as the Irish Sea to the populations of any individual site (i.e. Sea of the Hebrides MPA). In view of this, the screening criteria outlined below are considered to be relevant to the identification of relevant sites for which effects could be significant.

Two bird species have been designated in MPAs or MCZs, black guillemot (Fetlar to Haroldswick MPA, Papa Westray MPA, East Caithness Cliffs MPA) and razorbill (Cumbria Coast MCZ). Black guillemot is reported to have a maximum foraging range of 8km from the coast (Woodward *et al.* 2019). Given that carbon dioxide storage arrangements in Scottish territorial waters are devolved with Scottish Ministers, it is considered that activities in any of the areas applied for in the 1st carbon storage round will not affect this species. Razorbill was

added as a protected feature to the Cumbria Coast MCZ in 2019 for the population at St Bees Head, along with a small extension to the site boundary specifically relating to the protection of razorbill; this feature was considered to be in unfavourable condition at the time it was added to the site. While razorbill has a mean maximum foraging range of 73.8±48.4km[14], modelling by Cleasby *et al.* (2018) has revealed hotspots for breeding seabird use in relation to UK colonies, mapped as utilisation distributions (UD), with those for razorbill around St Bees Head showing a relatively limited distribution, with 95% UD being within 22km of the coast and the extension which was added to the site.

Other protected species include smelt, giant goby, seahorse and sandeel, however, the range of these species is limited or the nature of the protection of the features (e.g. in the case of sandeel for recruitment), is such that the distance based screening criteria below are considered to be relevant.

Table 3.1: Screening criteria used in this assessment to determine the potential for sites to be significantly affected

Physical and drilling effects: any area applied for should be screened in if it is within or overlaps with a site, together with any area within a buffer of 10km from a MPA or MCZ where there is a potential interaction between site features and exploration/appraisal activities in the area. **Underwater noise effects:** any area applied for that is within 15km of a MPA or MCZ with qualifying features regarded as sensitive to underwater noise (e.g. marine mammals, diving birds, and fish) should be screened in. In the context of measurements and modelling for the different sound sources, established injury threshold criteria and, relevant studies of observed effects, including those in the UKCS, 15km is considered to be a conservative estimate of a maximum distance within which likely significant effects could be expected from the loudest noise sources associated with seismic survey activities.

3.2 Stage 1 assessment

The information base referred to in Section 3.1 and the MCZ/MPA site-specific information has been used to inform the Stage 1 assessment to determine whether (MMO 2013[15]):

- the Department can exercise its functions to further the conservation objectives stated for the MCZ or MPA and;
- there is no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ or MPA.

If the exercise of the function would or might significantly hinder the achievement of the conservation objectives for an MCZ or MPA, the appropriate statutory conservation bodies, and where relevant Scottish Ministers, must be notified. As the Department's function at this

[14] Excludes data for Fair Isle where foraging range may have been unusually high as a result of reduced prey availability during the study year.
[15] Modified here to relate the stage of assessment to Section 125 and Section 82 of the *Marine and Coastal Access Act* and *Marine (Scotland) Act*, and to account for the consideration of MPAs in Scottish Waters.

stage is only in agreeing, or otherwise, to the issue of a carbon dioxide storage licence, it is not considered that Sections 125 (4)-(11) or Section 126 apply to this assessment.

The meaning of "hinder" has been taken to mean whether the Department's function in licensing could, alone or in-combination (MMO 2013):

- in the case of a conservation objective of "maintain", increase the likelihood that the current status of a feature would go downwards (e.g. from favourable to degraded) either immediately or in the future (i.e. they would be placed on a downward trend); or

- in the case of a conservation objective of "recover", decrease the likelihood that the current status of a feature could move upwards (e.g. from degraded to favourable) either immediately or in the future (i.e. they would be placed on a flat or downward trend).

Similarly, "further" can be taken to be where the Department's functions could:

- in the case of a conservation objective of "maintain", increase the likelihood that the current status of a feature would be maintained either immediately or in the future; or

- in the case of a conservation objective of "recover", increase the likelihood that the current status of a feature could move upwards (e.g. from degraded to favourable) either immediately or in the future.

Based on the above definitions, the function to which this assessment relates is unlikely to further the conservation objectives for any site, particularly in the current absence of a framework for net gain in the marine environment[16]. It is therefore concluded at this stage, that those sites screened into the assessment would proceed to a Stage 1 assessment on the basis that the Department would seek to proceed with licensing in a way that least hinders the conservation objectives of any site.

3.3 Cumulative effects

The Stage 1 assessment also considers the potential for cumulative effects resulting from the interaction of exploration/appraisal activities in the carbon dioxide storage licence areas with activities resulting from other marine plans, programmes and activities to lead to likely significant effects on relevant sites.

Marine planning has a key role in informing strategic and project level spatial considerations, with the Marine Policy Statement indicating, *"Marine Plans should reflect and address, so far as possible, the range of activities occurring in, and placing demands on, the plan area. The Marine Plan should identify areas of constraint and locations where a range of activities may be accommodated. This will reduce real and potential conflict, maximise compatibility between marine activities and encourage co-existence of multiple uses."*

[16] See: https://www.gov.uk/government/consultations/consultation-on-the-principles-of-marine-net-gain noting that such net gain would be separate, and in addition to, any measures considered to be of equivalent environmental benefit.

Marine plans adopted in England and Scotland cover all of the carbon dioxide storage areas applied for. To date, the marine plans acknowledge the potential interactions between activities, map key resource areas, and provide policy context and direction in relation to potential activity interactions. They are not spatially prescriptive and provide a limited indication of the location of possible future development, how co-location may be accommodated, or any form of activity prioritisation.

The uncertainty over the scale and timing of activities which could follow licensing of 1st carbon storage licensing round and the activities resulting from other plans and programmes is recognised. A GIS has been used to allow the areas applied for to be considered in the context of activities and proposals for a range of marine activities/potential activities.

3.4 Existing regulatory requirements and controls

This assessment assumes that the high-level controls described below are applied as standard to activities since they are legislative requirements. These are distinct from further control measures which may be identified and employed to avoid significant effects on relevant sites. These further control measures are identified in Sections 5.1-5.2 for the two main sources of effect identified, physical disturbance and underwater noise. The legislation covering environmental regulation of *Petroleum Act* related activities was effectively amended to incorporate carbon dioxide storage by the *Energy Act (Consequential Modifications) (Offshore Environmental Protection) Order 2010*. Therefore, the regulatory requirements and controls for exploration and appraisal of carbon dioxide stores are broadly comparable to those for oil and gas exploration and appraisal.

3.4.1 Physical disturbance and marine discharges

The routine sources of potential physical disturbance and drilling effects associated with exploration and appraisal are assessed and controlled through a range of regulatory processes, such as the *Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020*[17].

There is a mandatory requirement to have sufficient recent and relevant data to characterise the seabed in areas where activities are due to take place (e.g. rig placement)[18]. If required, survey reports must be made available to the relevant statutory bodies on submission of a relevant permit application or Environmental Statement for the proposed activity. The identification of any sensitive habitats by such survey (e.g. those under Annex I of the Habitats Directive or on the OSPAR List of Threatened and/or Declining Species and Habitats) may influence the Department's decision on a project-level consent.

Drilling chemical use and discharge is subject to strict regulatory control through permitting, monitoring and reporting (e.g. the mandatory Environmental Emissions Monitoring System (EEMS) and annual environmental performance reports). The use and discharge of chemicals must be risk assessed as part of the permitting process under the *Offshore Chemicals Regulations 2002* (as amended), and the discharge of chemicals which would be expected to have a significant negative impact would not be permitted.

[17] https://www.gov.uk/guidance/oil-and-gas-offshore-environmental-legislation
[18] BEIS (2021). The Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 - A guide. July 2021 - Revision 3.

At the project level, discharges would be considered in detail in project-specific EIAs and chemical risk assessments under existing permitting procedures.

3.4.2 Underwater noise effects

Controls are in place to cover all significant noise generating activities on the UKCS, including geophysical surveying. Seismic surveys (including VSP and high-resolution site surveys), sub-bottom profile surveys and shallow drilling activities require an application for consent under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) and cannot proceed without consent. These applications are supported by an EIA, which includes a noise assessment. On the noise thresholds to be used as part of any assessment, applicants are encouraged to seek the advice of relevant SNCB(s) (JNCC 2017) in addition to referring to European Protected Species (EPS) guidance (JNCC 2010). Note that EPS guidance is relevant to this assessment as all cetaceans are listed on Annex IV of the Habitats Directive, and therefore any cetaceans which are protected features of MCZs or MPAs would also be covered by this guidance.

The Department consults the relevant statutory consultees on the consent applications for advice and a decision on whether to grant consent is only made after careful consideration of their comments. Statutory consultees may request additional information or risk assessment, specific additional conditions to be attached to consent (such as specifying timing or other specific control measures) or advise against consent.

It is a condition of consents issued under Regulation 4 of the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) for seismic and sub-bottom profile surveys that the JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys are followed. Where appropriate, EPS disturbance licences may also be required under the *Conservation of Offshore Marine Habitats and Species Regulations 2017*[19], and further assessment may be required under Section 126 and 83 of the MCAA and M(S)A respectively. The updated JNCC guidelines (2017) reaffirm that adherence to these guidelines constitutes best practice and will, in most cases, reduce the risk of deliberate injury to marine mammals to negligible levels. Applicants are expected to make every effort to design a survey that minimises sound generated and consequent likely impacts, and to implement best practice measures described in the guidelines.

[19] Disturbance of European Protected Species (EPS) (i.e. those listed in Annex IV) is a separate consideration under Article 12 of the Habitats Directive, and is not considered in this assessment.

4 Screening

The screening criteria (see Section 3.1) were applied which led to the identification of a number of site/area combinations for which it was considered that effects of licensing could be significant (Table 4.1 and Figure 4.1). A Stage 1 assessment has been undertaken for these sites (Section 5). In view of the nature of the features screened in, only effects relating to physical disturbance and marine discharges are considered to be possible.

Table 4.1: Sites screened into the Stage 1 assessment

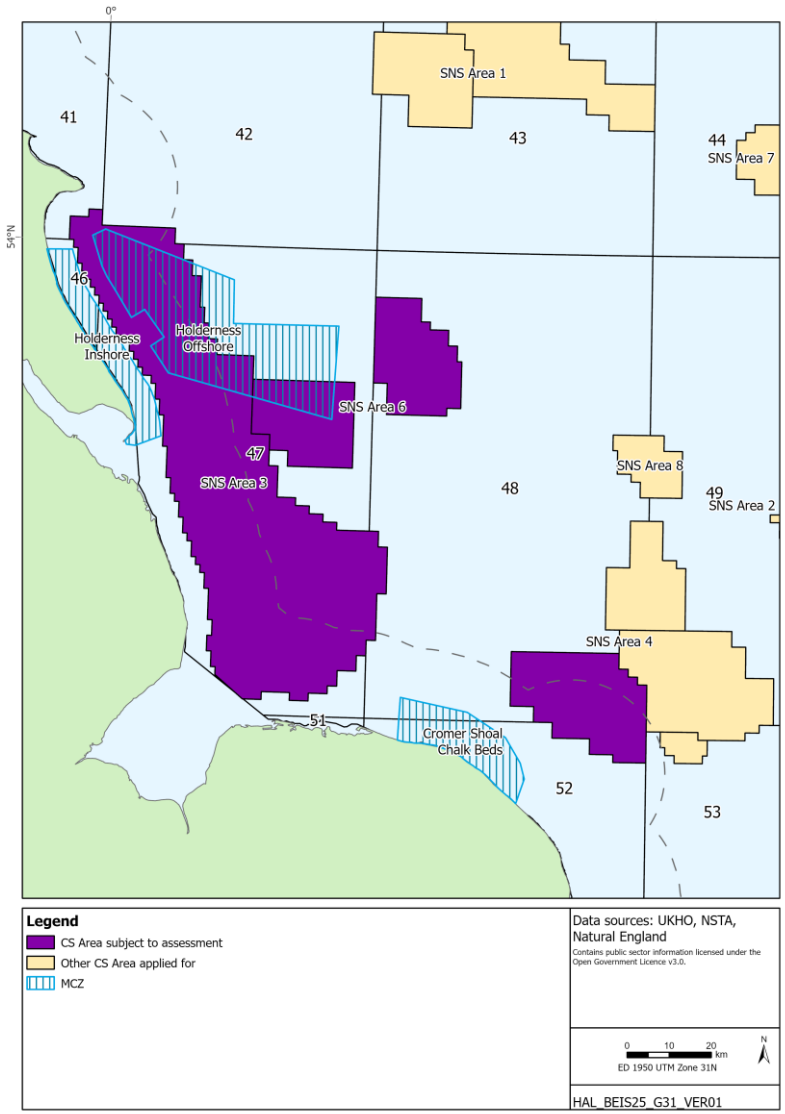
Site Name	Designated features	Feature status	CS Area
SOUTHERN NORTH SEA			
Holderness Inshore	High energy circalittoral rock, Intertidal sand and muddy sand, Moderate energy circalittoral rock, Subtidal coarse sediment, Subtidal mixed sediments, Subtidal mud, Subtidal sand, Spurn Head (Subtidal; geomorphological interest feature)	Feature condition assessment is not available. The attributes considered in the site SACO indicate a "maintain" target for most features, inferring favourable status[1]. The attribute, "Structure and function: presence and abundance of key structural and influential species" has a target to maintain, or recover, or restore, suggesting uncertainty in the status of this attribute for all relevant site features.	SNS Area 3
Holderness Offshore	Subtidal coarse sediment, Subtidal sand, Subtidal mixed sediments, Ocean quahog (*Arctica islandica*); North Sea glacial tunnel valleys (geological interest feature)	All features are considered to be in unfavourable condition other than the North Sea glacial tunnel valleys, which are in favourable condition.	SNS Area 3, SNS Area 6
Cromer Shoal Chalk Beds	High energy circalittoral rock, High energy infralittoral rock, Moderate energy circalittoral rock, Moderate energy infralittoral rock, North Norfolk coast (Subtidal), Peat and clay exposures, Subtidal chalk, Subtidal coarse sediment, Subtidal mixed sediments, Subtidal sand	Feature condition assessment is not available. The attributes considered in the site SACO indicate a "maintain" target for most features, inferring favourable status[1]. The attribute, "Structure and function: presence and abundance of key structural and influential species" has a target to maintain, or recover, or restore, suggesting uncertainty in the status of this attribute for all relevant site features.	SNS Area 4
IRISH SEA			
West of Walney	Sea-pen and burrowing megafauna communities, Subtidal mud, Subtidal sand	Feature condition assessment is not available. The vulnerability assessment for the site suggests it is unlikely to be moving towards its conservation objectives, but site condition monitoring is required to improve this assessment. Recovery targets have been set for the attributes, "Distribution: presence and spatial distribution of biological communities, Structure: species composition of component communities" – site specific notes indicate this target is based on the vulnerability assessment.	EIS Area 1
Fylde	Subtidal sand, subtidal mud	Feature condition assessment is not available. The attributes considered in the site SACO indicate a "maintain" target for most features, inferring favourable status[1]. The attribute, "Structure and function: presence and abundance of key structural and influential species" has a target to maintain, or recover, or restore, suggesting uncertainty in the status of this attribute for all relevant site features.	EIS Area 1

[1]*No site-specific supporting notes are available to better understand these targets.*

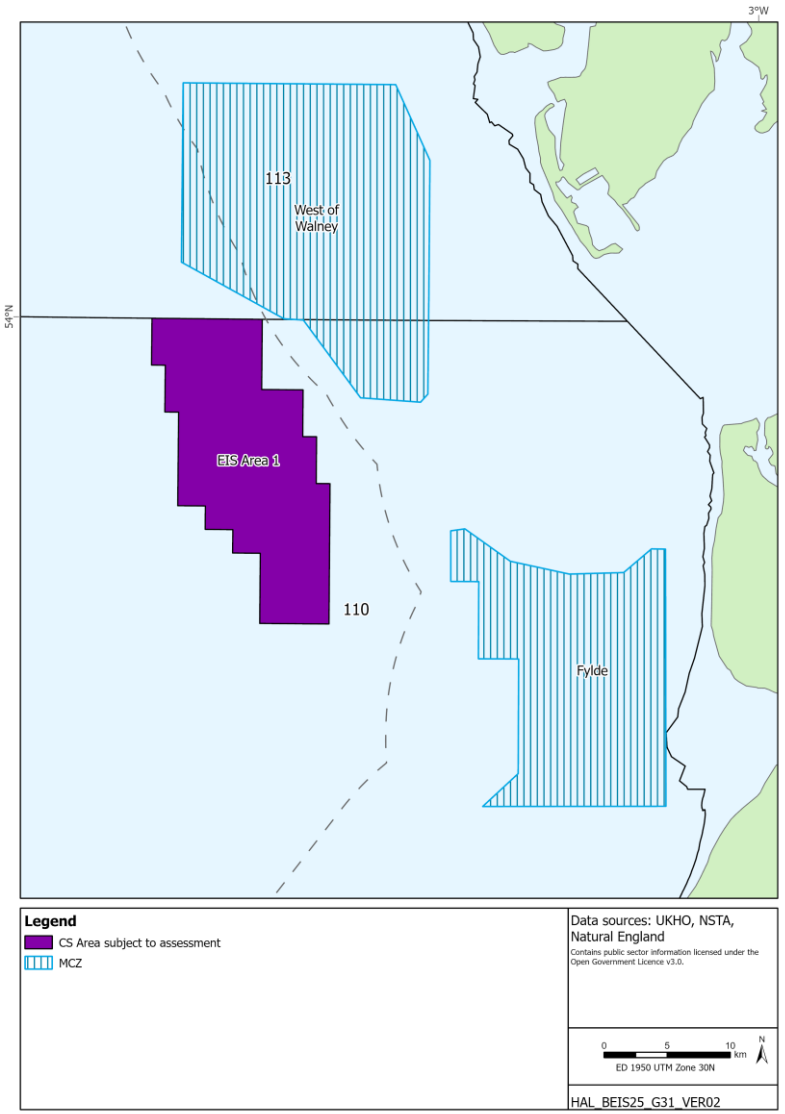
The conclusion of the screening stage is that of the 13 areas applied for only four (SNS Areas 3, 4 and 6 and EIS Area 1) had a pathway that could potentially lead to significant effects on a site and its features. All other areas applied for (see Figures 2.1 to 2.3) were screened out.

Figure 4.1: Areas applied for and sites screened in

Southern North Sea



Eastern Irish Sea



5 Stage 1 Assessment

The approach used in the Stage 1 assessment has been to take the proposed activity for each of the carbon storage licence areas as being the maximum of any application for that area, and to assume that all activity takes place. The maximum estimates of work commitments for the relevant areas derived from the applications to the NSTA or that may be considered by the NSTA to be required to enable appropriate appraisal of the areas are shown in Table 5.1. Only one of the licences applied for within the wider SNS Area 6 includes well operations in the work programme (an injectivity test into an existing well), this licence is ca. 10km from the Holderness Offshore MCZ boundary and is screened out from further assessment.

Completion of the work programmes is likely to involve one or more of the activities summarised in Table 2.1. Subsequent development activity is contingent on successful exploration and appraisal and may or may not result in the eventual installation of infrastructure, but a meaningful assessment of development level activity is not possible at this time. Where relevant, future activities will themselves be subject to activity specific assessment.

Table 5.1: High case work programmes relevant to the areas considered in this assessment

Area	Obtain[20] and/or reprocess 2D or 3D seismic data	Shoot 3D seismic	Appraisal/exploration wells
EIS Area 1	-	✓	One
SNS Area 3	✓	✓	Two
SNS Area 4	✓	✓	One[1]
SNS Area 6	✓	✓	-[2]

Notes: [1]Only one of the licences applied for within the wider SNS Area 4 has been screened in for further assessment. The work programme for this licence includes one well.
[2]Only one of the licences applied for within the wider SNS Area 6 includes well operations (an injectivity test into an existing well), and as indicated above has been screened out from further assessment.

5.1 Southern North Sea

As noted in Section 4, the source of effect relevant to the southern North Sea sites screened in is for physical disturbance and marine discharges related to exploration/appraisal well drilling. The following sections provide a description of the relevant sites followed by an assessment of the potential for the pressures associated with drilling and discharges to hinder the achievement of site conservation objectives.

[20] To obtain seismic data means purchasing or otherwise getting the use of existing data and does not involve shooting new seismic.

5.1.1 Relevant sites

Holderness Inshore MCZ[21]

The site is located between Skipsea in the north and Spurn Head in the south, extending 6km offshore and covering an area of 309km^2. The site is designated for intertidal sand and muddy sand, moderate and high energy circalittoral rock, a range of other subtidal sediments from mud to coarse sediment, and the Spurn Head geological feature.

The intertidal area is made up of an open beach of relatively mobile sediments, backed by soft, readily eroding cliff comprising glacial tills overlain with sands (see Balson *et al.* 1998, Blewett & Huntley 1998). The subtidal area of the site is composed of high and moderate energy circalittoral rock, subtidal coarse and mixed sediment, subtidal mud and subtidal sand with subtidal water depths reaching approximately 15m. The rocky interest features of the site are made up of cobble, boulder and post-glacial deposits.

The site is also designated for a subtidal elements of the Spurn Head geological feature[22] which includes a ridge of clay banks at the entrance to the Humber Estuary known locally as "The Binks". This is a harder geological area than that which surrounds it, thought to be Quaternary boulder clay, and traps sediment reducing erosion to the Spurn Head feature. HR Wallingford (2002) indicated that the tidal current of the Humber Estuary acts as a hydraulic groyne and partly blocks the passage of gravels and some sands, which are deposited north of the Binks, and also into New Sand Hole which acts as a sediment sink (Scott Wilson 2009).

The diverse substrates across the site support hydroid/bryozoan turf, sponges and other encrusting fauna, benthic, demersal and juvenile fish species, a small number of elasmobranch species as well as commercially significant crustaceans.

Holderness Offshore MCZ[23]

The Holderness Offshore MCZ with an area of 1,176km^2 is partly inshore and partly offshore, in depths ranging from just over 5m to 50m. The majority of the site experiences moderate wave and current energy at the seabed with lower wave energy towards the east of the site, and tidal currents near the site primarily occur in a southwest and northeast direction.

The site contains good examples of the broad-scale habitats Subtidal mixed sediment, Subtidal sand and Subtidal coarse sediment. The southeast of the site also contains an area of geological interest (the northern point of the Inner Silver Pit glacial tunnel). This area has a high species biodiversity and is an ecologically important area providing habitats for many species; the brittle star, *Ophiothrix fragilis* has been identified in high abundances (Tappin *et al.* 2011), and commercially significant European lobster (*Homarus gammarus*), edible or brown crab (*Cancer pagurus*) and scallops (e.g. *Aequipecten opercularis*) are abundant over much of the area. Additionally, the threatened and/or declining ocean quahog (*Arctica islandica*) is also found within this MCZ (García *et al.* 2019) and is a protected feature of the site.

[21] Site description in part based on: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0035#backgroundinfo, Net Gain (2011): http://publications.naturalengland.org.uk/publication/1466980

[22] See the Geological Conservation Review site report: https://webarchive.nationalarchives.gov.uk/ukgwa/20190301161541mp_/http://jncc.defra.gov.uk/pdf/gcrdb/GCRsiteaccount2111.pdf

[23] Site description based on: https://jncc.gov.uk/our-work/holderness-offshore-mpa/, Net Gain (2011): http://publications.naturalengland.org.uk/publication/1466980

Cromer Shoal Chalk Beds MCZ[24]

The Cromer Shoal Chalk Beds MCZ on the North Norfolk Coast extends from Weybourne to Happisburgh, from 200m off the coast to a distance of between 5 and 10km offshore, has an area of 315.64km^2 (Net Gain 2011), and slopes to a depth of 27m LAT (Green 2015). The site includes important geological features, including the best examples of subtidal chalk beds in the North Sea as well as subtidal exposures of clay and peat in the northwest of the site. Topographically, the site is broadly flat, but contains ridges, gullies, and undulations.

A large area of infralittoral rock extends for almost the entire length of the site from east to west, but is generally restricted to shallow inshore waters (up to 10m depth). This wide area of hard, stable substrate provides a suitable habitat for attached and mobile epifauna, with the site mostly dominated by gravel interspersed with fine sediments. Crustaceans settle in the crevices formed by the erosion of the chalk, including lobsters (*Homarus* sp.), langoustines (Nephropidae sp.) and brown crab (*Cancer pagurus*). Grazing animals including the common limpet (*Patella vulgata*), chitons (*Leptochiton* sp.) and gastropods such as the topshell (*Calliostoma zizyphinum*) are supported by the growth of algae on the shallow chalk beds. The nearshore is often dominated by foliose red and brown algae. Extending beyond this infralittoral rock into deeper water is a band of circalittoral rock with more epifauna and, as a result of less light penetration, a marked decrease in macroalgae (Green & Dove 2015). Many mobile crustaceans settle in the crevices formed by the erosion of the chalk, including lobsters and brown crab. Both the areas of infralittoral and circalittoral rock are comprised of subtidal chalk, as well as other rock types.

Blue mussel beds (*Mytilus edulis*) have historically been reported in the east of the site, but recent surveys have only found aggregations of dead mussel shells. Large populations of the Ross worm (*Sabellaria spinulosa*) have been confirmed at numerous locations in the east (Green & Dove 2015).

Following a curve directly offshore from Sheringham, East and West Runton, to Cromer, subtidal chalk occurs quite close to the intertidal zone, but extends further offshore in the southeast portion of the site. In this area, towards Sea Palling, the inshore chalk is replaced by subtidal sand and mixed sediments. Further offshore, beyond the chalk beds, the site is dominated by subtidal coarse sediments, with a thin band of mixed sediments running from east to west. To the northwest, the coarse sediments transition to finer material, with a mixture of subtidal mud and sand. This area of the southern North Sea is a dynamic environment with vast quantities of sediment constantly moved around the site by tides and currents (HR Wallingford 2002), so the sediment distributions and rock exposures are subject to change; new areas of chalk may become exposed, and others become covered by sediment when there are tidal surges or storms (JNCC 2004).

5.1.2 Assessment

The conservation objectives of relevant sites and information relating to site selection and advice on operations have been considered against the work programme for the areas applied for to determine whether site conservation objectives could be hindered. The results are given in Table 5.2 below. All mandatory control requirements (Section 3.4), are assumed to be in place as a standard for all activities assessed.

[24] Site description based on: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0031 and Net Gain (2011): http://publications.naturalengland.org.uk/publication/1466980

Table 5.2: Consideration of potential physical disturbance and drilling effects and relevant site conservation objectives

Holderness Inshore MCZ[25]
Site Information
Area (ha/km^2): 30,887/308.9 **Designated features**: Subtidal coarse sediment, Subtidal sand, Subtidal mixed sediments, Ocean quahog (*Arctica islandica*); North Sea glacial tunnel valleys (geological interest feature) **Conservation objectives**: The conservation objective is that the protected habitats: • Are maintained in favourable condition if they are already in favourable condition; • Be brought into favourable condition if they are not already in favourable condition. For each protected feature, favourable condition means that, within the MCZ: • Its extent is stable or increasing; • Its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate. Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery. For the geological feature within the MCZ (Spurn, subtidal) favourable condition means: • Its extent, component element and overall integrity are maintained; • Its structure and functioning are unimpaired; • The feature remains unobscured so its condition may be determined. Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.
Relevant licence areas with potential for physical disturbance and drilling effects
SNS Area 3
Activities associated with the proposed work programmes within the relevant licence areas
Drilling up to two wells involving - siting of rig, drilling discharges
Assessment of effects on site integrity
Rig siting (**Relevant pressures:** *penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion; physical change (to another sediment/seabed type), introduction or spread of non-indigenous species*) SNS Area 3 does not overlap the Holderness Inshore MCZ and so there will be no direct physical impacts on the site from rig siting, however, some parts of SNS Area 3 are within the assumed distance from a jack-up rig within which effects may occur (500m, see Table 2.1), being a minimum of 250m of the site. Should a rig be located within 250m the site, the maximum spatial footprint of the disturbance pressure associated with jack-up rig siting is small (approximately 0.3km^2) compared to the site area (covering 0.095%) – note this assumes a well would be drilled at the western edge of SNS Area 3, and in one of a small number of areas which are within 250m of the site. While the conservation status for the site's protected features is not presently available, the supplementary advice on conservation objectives (SACO), and related attributes and targets have been considered. It has been concluded that the siting of a rig in SNS Area 3 will not result in direct physical impacts, and it is not considered possible that the extent, structure, or function of any of the features of the Holderness Inshore MCZ will be affected in a way in which the achievement of the conservation objectives of the site will be hindered. There may be a requirement for rig stabilisation depending on local seabed conditions. In soft sediments, deposited rock may cover existing sediments resulting in a physical change (to another seabed type), and the protected features which have the potential to be impacted by rig siting are considered to be sensitive to this

[25] https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0035

pressure, which assumes a permanent change of habitat. The potential area of change in sediment/seabed type from rig stabilisation is small (estimated at 0.001-0.004km^2 per rig siting, see Table 2.1), and while there is the potential for a rig to be sited within 250m of the Holderness Inshore MCZ, should rig stabilisation be required any related rock placement (or other forms of stabilisation such as removeable mud mats) would be outside of the site boundaries, such that, within the MCZ, effects on the extent, structure, and function of the protected features will not occur, and the achievement of the conservation objectives for these features will not be hindered.

The risks to the Spurn Head geological feature from pressures related to exploration and appraisal drilling has not been assessed for Holderness Inshore MCZ[26], however, as any rig would be located outside of the Holderness Inshore MCZ and have no direct impacts on the feature, and be on location for only a short period of time (up to 10 weeks), it is considered unlikely that its presence could affect coastal and offshore sediment transport in a way that would affect the extent of the feature, or impair its structure or function.

Management of the spread of non-native species from vessels and rigs is being progressed through international measures, and the risk is limited by the operational range of rigs on the UKCS.

Drilling discharges
(**Relevant pressures:** *abrasion/disturbance of the substrate on the surface of the seabed; habitat structure changes - removal of substratum (extraction*), *contaminants, smothering and siltation rate changes)*

The advice on operations indicates that the protected features are sensitive to the above pressures, most of which relate to seabed disturbance and habitat changes associated with smothering by drill cuttings near the well location, and that these cuttings can accumulate in piles where currents are generally weak. It is assumed that effects relating to drilling discharges occur within 500m of the well location (Table 2.1). Therefore, with respect to SNS Area 3 which is located entirely outside of the site, drilling discharges will not significantly impact the extent, structure, or function of the protected features. For the areas applied for within 250m of the site, the maximum spatial footprint within which smothering by drilling discharges and associated habitat structure changes may occur (0.3km^2) is small (representing 0.095% of the total site area) and given the site's exposure to wave energy and high suspended sediment loads related to erosion of the Holderness coast (e.g. Cefas 2016, Blewett & Huntley 1998), redistribution of drilling discharges and recovery from smothering would be rapid, and any change can be considered to be temporary and not significant. Therefore, drilling discharges will not hinder the achievement of the site's conservation objectives.

Cumulative effects
Intra-plan cumulative effects are considered to be unlikely as only SNS Area 3 was identified as relevant to the assessment. Up to two wells are proposed, such that if both the wells are drilled within 250m of the site, up to 0.6km^2 of the site (0.19%) could be indirectly affected. In keeping with the above consideration, it is not considered that the scale of this effect, its temporary nature, and that there will be no direct impacts on the site, are such that the licensing of SNS Area 3 will not significantly hinder achieving the conservation objectives of the site. Section 5.1.3 provides a consideration of potential activities cumulatively with other relevant plans and projects.

Conclusion
The siting of a rig in SNS Area 3 will not hinder the achievement of the Holderness Inshore MCZ site conservation objectives.

Holderness Offshore MCZ[27]

Site Information

Area (ha/km^2): 117,600/1,176
Designated features: High energy circalittoral rock, Intertidal sand and muddy sand, Moderate energy circalittoral rock, Subtidal coarse sediment, Subtidal mixed sediments, Subtidal mud, Subtidal sand, Spurn Head (Subtidal; geomorphological interest feature).

Conservation objectives:
The conservation objective is that the protected features:

- so far as already in favourable condition, remain in such condition;
- so far as not already in favourable condition, be brought into such condition, and remain in such condition.

[26] https://designatedsites.naturalengland.org.uk/Marine/FAPMatrix.aspx?SiteCode=UKMCZ0035
[27] https://jncc.gov.uk/our-work/holderness-offshore-mpa/

With respect to Subtidal coarse sediment, Subtidal sand and Subtidal mixed sediments within the MCZ, this means that:

- its extent is stable or increasing, and
- its structures and functions, its quality, and the composition of its characteristic biological communities (which includes a reference to the diversity and abundance of species forming part of or inhabiting that habitat) are such as to ensure that it remains in a condition which is healthy and not deteriorating.

Any temporary deterioration in condition of the Subtidal coarse sediment, Subtidal sand and Subtidal mixed sediments features is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery. Any alteration to that feature brought about entirely by natural processes is to be disregarded.

With respect to the Ocean quahog (*Arctica islandica*) within the MCZ, this means that the quality and quantity of its habitat and the composition of its population in terms of number, age and sex ratio are such as to ensure that the population is maintained in numbers which enable it to thrive. Any temporary reduction of numbers is to be disregarded if the population is sufficiently thriving and resilient to enable its recovery. Any alteration to that feature brought about entirely by natural processes is to be disregarded.

With respect to the North Sea glacial tunnel valleys within the Zone, this means that:

i. its extent, component elements and integrity are maintained;
ii. its structure and functioning are unimpaired; and
iii. its surface remains sufficiently unobscured for the purposes of determining whether the conditions in paragraphs (i) and (ii) are satisfied.

Any obscurement of that feature brought about entirely by natural processes is to be disregarded. Any alteration to that feature brought about entirely by natural processes is to be disregarded.

Relevant licence areas with potential for physical disturbance and drilling effects

SNS Area 3

Activities associated with the proposed work programmes within the relevant licence areas

Drilling up to two wells involving - siting of rig, drilling discharges

Assessment of effects on site integrity

Rig siting

(**Relevant pressures:** *penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion; physical change (to another sediment/seabed type), introduction or spread of non-indigenous species*)

SNS Area 3 partly overlaps the Holderness Offshore MCZ. The advice on operations for the site indicate that all of the site features are sensitive to the above pressures, which are relevant to the siting of drilling rigs and related exploration drilling. SNS Area 3 has a significant area outside the site boundaries in which a rig may be sited, and there is considerable potential that physical disturbance effects may be avoided. Should a rig be located within the site, the maximum spatial footprint of the penetration and/or disturbance pressure associated with jack-up rig siting is small (0.8km^2, see Table 2.1) compared to the site (covering 0.07%). It is noted that, with the exception of the North Sea glacial tunnel valley, that the site's features are judged to be in unfavourable condition[28], the reasons for which are set out in the site's SACO, which relate to the sensitivities of the site's features to ongoing pressures, which are identified as oil and gas related activities, including the nature and extent of pipeline and other protection materials, and also demersal fishing activity; these activities were present over the site in advance of its designation. The placement of a rig within the site, should this occur, would result in temporary effects, with the depressions arising from spud can placement likely to infill and be reworked relatively rapidly (for example see Section 4.4.1 of BEIS 2022b), noting the relatively dynamic nature of much of the site. It is not considered likely that the temporary placement of a rig within the site will affect the extent, structure, or function of any of the features of the Holderness Offshore MCZ in a way in which the achievement of the conservation objectives of the site will be significantly hindered.

There may be a requirement for rig stabilisation depending on local seabed conditions. In soft sediments, deposited rock may cover existing sediments resulting in a physical change (to another seabed type), and the protected features which have the potential to be impacted by rig siting are considered to be sensitive to this pressure, which assumes a permanent change of habitat. The SACO for the MCZ notes that the confidence in the "recover" objective for the site, e.g. in relation to the extent and distribution attribute, would be improved with

[28] https://hub.jncc.gov.uk/assets/d439f5d1-5440-4547-84fb-8bd6ec970e44#HoldernessOffshore-ConservationStatements-V1.0.pdf

better information on the total volumes of protection materials which have been placed within the site. The advice within the SACO is that activities should look to minimise, as far as is practicable, changes in substrata within the site, which may also affect the extent and distribution of the supporting habitat of other features such as the ocean quahog. Should a rig be sited within the Holderness Offshore MCZ and stabilisation material be required, the potential change of sediment/seabed type is small (estimated area of 0.001-0.004km^2 per rig siting, see Table 2.1), at up to 0.0003% of the site area. The use of rock placement for rig stabilisation, which is not easily removed, would likely result in a localised but permanent change in habitat. Where possible, and subject to meeting the technical and safety requirements of rig placement at a particular location, removable mud mats or anti-scour mats should be used if drilling takes place within the site. Where this is not possible, the extent of rock placement should be minimised. In view of the very small scale of potential impact on the site, and the potential for mitigation both through avoiding drilling within the site, or the use of methods to avoid a permanent change in habitat type, it is concluded that the licensing of SNS Area 3 will not significantly hinder the achievement of the site's conservation objectives.

Management of the spread of non-native species from vessels and rigs is being progressed through international measures, and the risk is limited by the operational range of rigs on the UKCS.

Drilling discharges
(**Relevant pressures:** *abrasion/disturbance of the substrate on the surface of the seabed; habitat structure changes - removal of substratum (extraction*), *contaminants, smothering and siltation rate changes)*

The site's features are sensitive to abrasion/disturbance of the seabed surface, siltation rate changes including smothering (other than ocean quahog) and habitat structure changes, removal of substratum (extraction) pressures associated with drilling discharges. The advice on operations indicates that the protected features have not been assessed against whether they are sensitive to contaminants pressures. Any discharge from exploration well drilling would be subject to risk assessment as part of existing regulatory controls (see Section 3.4.1). It is assumed that effects relating to drilling discharges occur within 500m of the well location (Table 2.1). For each well, the maximum spatial footprint within which smothering by drilling discharges may occur (0.8km^2) is small (representing 0.07% of the total site area) and given the dynamic nature of much of the southern North Sea, redistribution of drilling discharges and recovery from smothering would be rapid. While the SACO suggests the potential for drill cuttings piles from existing and historical activities to impact the site, drill cuttings piles do not generally accumulate in shallow, high energy waters, such as in the southern North Sea. It should be noted that a substantial area of SNS Area 3 is located outside of the MCZ, and within which rig siting may be possible, avoiding interaction with the site. The small scale and temporary nature of potential smothering, as well as mandatory control requirements with respect to drilling chemical use and discharge, are such that it is concluded discharges will not significantly hinder the achievement of the site's conservation objectives.

Cumulative effects
Intra-plan cumulative effects are possible although spatial footprints associated with rig installation and drilling discharges in SNS Area 3 are localised and temporary, and unlikely to overlap either spatially or temporally. Given the indicative work programme, the combined spatial footprint within which physical disturbance and drilling effects could occur (within 500m of the rig/well location) for the two proposed wells is 1.6km^2 (0.14% of the site). With regards to rig stabilisation, should both wells be drilled within the site, this could cover an area of 0.008km^2 or 0.0007% of the site area. The localised and temporary nature of the disturbance and available mitigation to avoid permanent change to the extent and distribution of the site's feature, are such that it is concluded that combined effects of licensing of SNS Area 3 will not significantly hinder the site's conservation objectives. Section 5.1.3 provides a consideration of potential cumulative effects with other projects.

Conclusion
The siting of a rig in SNS Area 3 will not significantly hinder the achievement of the Holderness Offshore MCZ site conservation objectives.

Cromer Shoal Chalk Beds MCZ[29]

Site Information

Area (ha/km^2): 32,048/320.5
Designated features: High energy circalittoral rock, High energy infralittoral rock, Moderate energy circalittoral rock, Moderate energy infralittoral rock, North Norfolk coast (Subtidal), Peat and clay exposures, Subtidal chalk, Subtidal coarse sediment, Subtidal mixed sediments, Subtidal sand.

[29] https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0031 – the conservation advice package for this site is under review.

Conservation objectives:
The conservation objective is that the protected habitats:

- Are maintained in favourable condition if they are already in favourable condition;
- Be brought into favourable condition if they are not already in favourable condition.

For each protected feature, favourable condition means that, within the MCZ:

- Its extent is stable or increasing;
- Its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate.

For the feature of geological interest, favourable condition means, within the MCZ:

1. Its extent, component element and overall integrity are maintained;
2. Its structure and functioning are unimpaired;
3. Its surface remains sufficiently unobscured for the purposes of determining whether the conditions in paragraphs (1) and (2) are satisfied.

Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.

Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.

Relevant licence areas with potential for physical disturbance and drilling effects

SNS Area 4

Activities associated with the proposed work programmes within the relevant licence areas

Drilling up to one well involving - siting of rig, drilling discharges

Assessment of effects on site integrity

Rig siting
(**Relevant pressures:** *penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion; physical change (to another sediment/seabed type), introduction or spread of non-indigenous species*)

SNS Area 4 is located 6.4km to the southwest of Cromer Shoal Chalk Beds MCZ, and direct physical impacts on any of the site's protected features are not considered to be possible noting the assumed distance from a jack-up rig within which effects may occur (500m, see Table 2.1). There may be a requirement for rig stabilisation depending on local seabed conditions. In soft sediments, deposited rock may cover existing sediments resulting in a physical change (to another seabed type) of a scale in the order of 0.001-0.004km^2 per rig siting, and the site's protected features are considered to be sensitive to this pressure, which assumes a permanent change of habitat. As noted above, the assumed distance from a jack-up rig within which effects may occur (500m) is considerably less than the distance between SNS Area 4 and the Cromer Shoal Chalk Beds MCZ.

Management of the spread of non-native species from vessels and rigs is being progressed through international measures, and the risk is limited by the operational range of rigs on the UKCS.

Drilling discharges
(**Relevant pressures:** *abrasion/disturbance of the substrate on the surface of the seabed; habitat structure changes - removal of substratum (extraction*), *contaminants, smothering and siltation rate changes)*

The advice on operations indicates that the relevant qualifying features are sensitive to the above pressures, most of which relate to seabed disturbance and habitat changes associated with smothering by drill cuttings near the well location, and that these cuttings can accumulate in piles where currents are generally weak. It is assumed that effects relating to drilling discharges occur within 500m of the well location (Table 2.1), therefore, drilling discharges will not impact the extent, structure, and function of the protected habitats.

Cumulative effects
Intra-plan cumulative effects are not considered to be possible as only SNS Area 4 was identified as relevant to the assessment and only one related work programme has been proposed. Section 5.1.3 provides a consideration of potential cumulative effects with other projects.

Conclusion
The siting of a rig in SNS Area 4 will not hinder the achievement of the Cromer Shoal Chalk Beds MCZ site conservation objectives.

5.1.3 Cumulative effects

There are a number of potential interactions between activities that may follow licensing and those existing or planned activities, for instance in relation to renewable energy, offshore oil and gas and gas storage (including carbon dioxide storage), fishing, and aggregate extraction. These activities are subject to individual permitting or consenting mechanisms or are otherwise managed at a national level. Interactions have been identified on the basis of the nature and location of existing or proposed activities and spatial datasets in a Geographic Information System (GIS). Projects relevant to this in-combination effects assessment, along with their status and relevant sites are tabulated in Table 5.3.

The areas applied for are within the East Inshore and Offshore Marine Plan areas. East Marine Plan policy CCS1 defines a range of areas of potential carbon dioxide storage, which includes existing gas fields and related infrastructure and saline aquifers, in which proposals should not prevent storage, or else indicate how impacts on storage will be minimised, mitigated, or else suitably justify a case for proceeding. Paragraph 329 of the Plans indicate that "*Policy CCS1 is included to help ensure that sufficient storage sites are available for Carbon Capture and Storage over the long-term in view of the large number of such sites, on a national and international scale. Carbon Capture and Storage is spatially restricted to where storage locations occur.*" This is supported in plan policies such as GOV2 and GOV3, which respectively promote the maximisation of activity co-existence, and the demonstration that activity displacement will be avoided, minimised, or mitigated.

Table 5.3: Projects relevant to the cumulative effects assessment for the southern North Sea

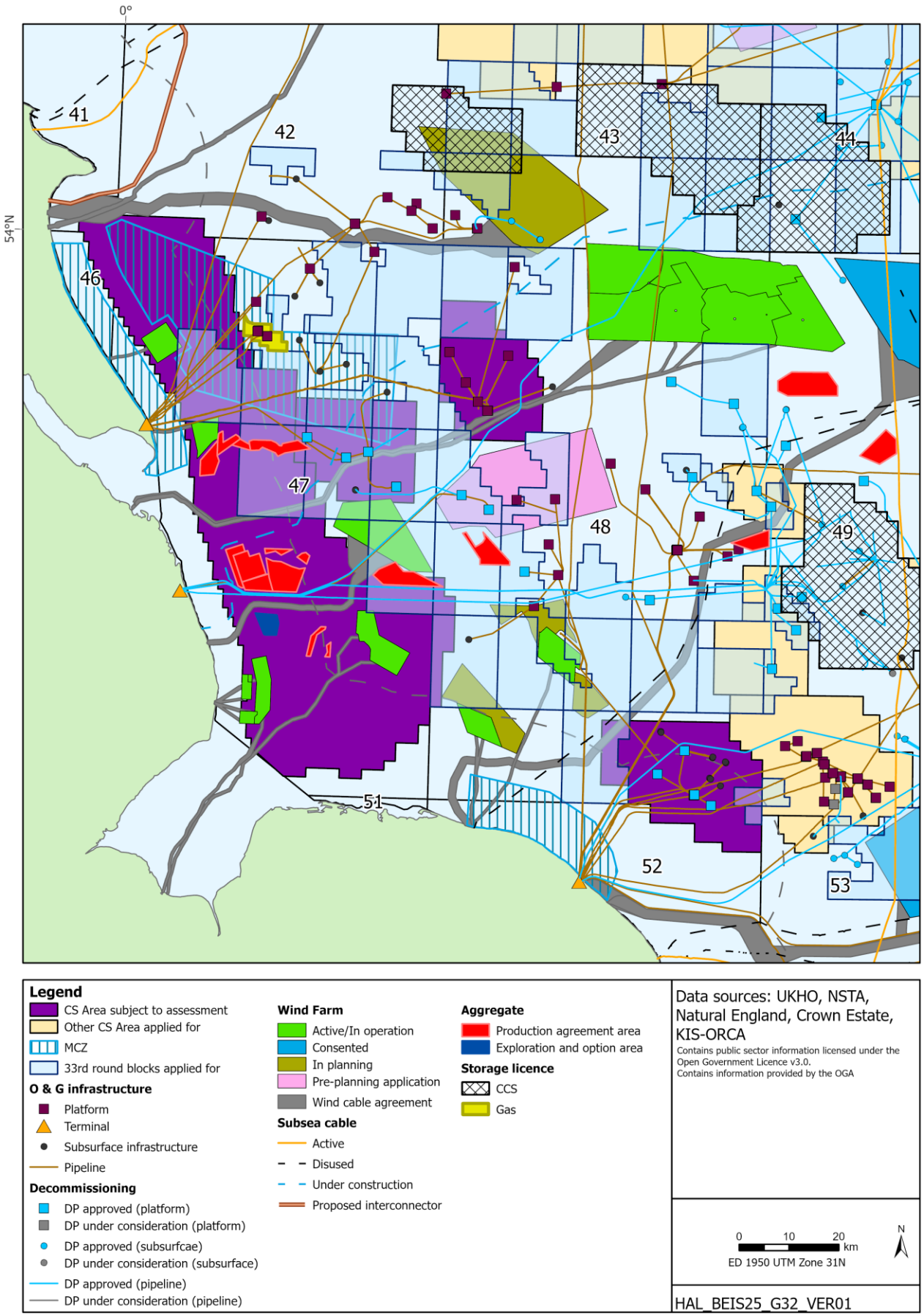
Relevant project	Project summary	Project status	Relevant sites[1]
Humber Gateway offshore wind farm	The project has 73 turbines providing an installed capacity of 219MW, with export cabling having its landfall on the south of the Holderness coast near Easington.	Operational	Holderness Inshore MCZ, Holderness Offshore MCZ
Westermost Rough offshore wind farm	The project includes 35 turbines providing an installed capacity of 210MW, with export cabling having its landfall on the Holderness coast near Withernsea.	Operational	Holderness Inshore MCZ
Hornsea Project Three wind farm (export cable)	It is expected that up to 6 cables will take power ashore in a corridor extending from the south west corner of the zone to a landfall on the North Norfolk Coast.	Consented. Offshore construction expected from 2024.	Cromer Shoal Chalk Beds MCZ
Norfolk Vanguard/Boreas wind farms (export cable)	The landfall for these projects is proposed to be at Happisburgh South.	Consented	Cromer Shoal Chalk Beds MCZ
Sheringham Shoal and Dudgeon offshore wind farm (export cable)	The export cables have their landfall near Weybourne Hope.	In operation	Cromer Shoal Chalk Beds MCZ

Relevant project	Project summary	Project status	Relevant sites[1]
Sheringham and Dudgeon extension projections (export cable)	It is proposed that the export cables for the two projects are at Weybourne beach.	In planning	Cromer Shoal Chalk Beds MCZ
Tolmount gas field (export pipeline)	Located in Block 42/28d, the Tolmount gas field development includes a minimal facilities platform and a new gas export pipeline to shore.	In operation	Holderness Inshore MCZ, Holderness Offshore MCZ
Easington Gas terminal related pipelines	Pipelines include those for the York, Cleeton, Amethyst and West Sole fields, as well the Langeled pipeline and that for Rough gas storage.	In operation	Holderness Inshore MCZ, Holderness Offshore MCZ
Bacton Gas terminal related pipelines	Pipelines include those for the Shearwater, Esmond, Clipper, Leman and Hewett fields, with some subject to decommissioning planning.	In operation	Cromer Shoal Chalk Beds MCZ
Rough Gas storage	A gas storage licence was issued in July 2022 covering the Rough field. The field was previously used for gas storage, and its present phase does not include any new offshore work, i.e. existing wells, pipelines and platforms are to be used to storge gas at Rough.	In operation	Holderness Offshore MCZ
Viking Link interconnector	1,400MW interconnector between Bicker Fen in Lincolnshire and Revsing in South Jutland, Denmark. The cable will be trenched and buried in the North Sea, with the landfall completed using trenchless methods.	Under construction	Holderness Offshore MCZ
Gas field infrastructure	Producing gas fields (including Ceres, Mercury, York, Apollo) or which have ceased production. These primarily include subsea templates, wellheads, and pipelines, with relatively few platforms (York, Rough). The Rough gas storage site recommenced operations in 2022.	In operation	Holderness Offshore MCZ
33rd seaward oil & gas licensing round	Seven Blocks in the southern North Sea (47/3k, 47/7b, 47/8a, 47/9a, 47/10c, 47/14, 47/15) have been applied for and are relevant to the assessment. Activities as part of their work programmes include the drilling of wells.	Areas have been applied for and are not yet licensed.	Holderness Inshore MCZ, Holderness Offshore MCZ
Round 4 wind preferred projects (export cables)	The route of any export cable associated with these projects is uncertain. The assessment is informed by the Round 4 MCZ assessment.	Pre-planning	Holderness Inshore MCZ, Holderness Offshore MCZ, Cromer Shoal Chalk Beds MCZ

Source: relevant Development Consent Orders and related post-consent modifications (https://infrastructure.planninginspectorate.gov.uk/), BEIS: decommissioning of offshore installations and pipelines (https://www.gov.uk/guidance/oil-and-gas-decommissioning-of-offshore-installations-and-pipelines), TCE Open Data Portal (https://thecrownestate.maps.arcgis.com/apps/webappviewer/index.html?id=b7f375021ea845fcabd46f83f1d48f0b) NSTA gas storage and unloading webpage (https://www.nstauthority.co.uk/licensing-consents/gas-storage-and-unloading/

Notes: [1] those sites considered to be relevant to 1st carbon dioxide storage round exploration/appraisal activities.

Figure 5.1: Location of areas applied for in relation to other projects in the southern North Sea



Physical disturbance and drilling effects

The features protected by Holderness Inshore MCZ, Holderness Offshore MCZ and the Cromer Shoal Chalk Beds MCZ are benthic habitats, and are therefore only considered to be sensitive to those physical effects related to the work programmes for SNS Area 3 and SNS Area 4, as already assessed in relation to the sites in Section 5.1.2. The conclusions of that section are considered here in the context of those relevant projects identified in Table 5.3 above.

The area covered by the Holderness Inshore MCZ has historically been subject to pipeline installation to the gas terminals at Easington and Dimlington; the SACO for the site notes that pipeline trenches which appear to have been excavated through the mixed sediment and the underlying glacial till, do not show signs of having been naturally infilled since construction (Colenutt & Kinnear 2014), such that they represent a long-term/permanent change to the site. More recently, the export pipeline for the Tolmount project was installed through both the Holderness Inshore and Offshore MCZs. Impacts to the sites were considered to be small scale (0.13% of the site area) or temporary, and it was concluded that the installation of the pipeline would not hinder achieving the conservation objectives for either of the sites[30]. Wind farm export cables associated with Westermost Rough and Humber Gateway cross the Holderness Inshore MCZ. Like the majority of the pipelines associated with Easington/Dimlington, these cables were consented and installed in advance of the Holderness Inshore MCZ being designated. While there would have been some change to the extent and distribution, and perhaps function, of a small area of the site, the current SACO does not identify these as site-specific concerns. For most attributes, targets have been set to maintain the feature or in relation to the presence and abundance of key structural and influential species, to maintain, recover or restore the attribute, suggesting a lack of information on the feature status. While SNS Area 3 is close to Holderness Inshore MCZ (at least 250m away), noting that the distance within which effects are predicted to occur from the siting of a rig and any related discharges (500m), it is possible for cumulative physical effects from existing activities to take place, but these could only be indirect in nature. Noting the large proportion of SNS Area 3 which is well over 500m from the site, the temporary and indirect nature of any potential effect, and with reference to the current condition of the site features inferred from the SACO, the licensing of SNS Area 3 would not result in cumulative effects which could significantly hinder the achievement of the site's conservation objectives.

Eight gas fields (Ceres, Mercury, York, Apollo, Helvellyn, Eris, Amethyst East and West) and one gas storage site (Rough) are located within the Holderness Offshore MCZ, though in terms of surface infrastructure, only York and Rough have associated platforms; all the other fields are produced via subsea tie-backs to installations outside of the site. A number of pipelines are associated with these fields, or fields located beyond the site boundaries, including those for Cleeton and West Sole, and also the Langeled pipeline. The presence of oil and gas infrastructure is noted in the site SACO[31], with the Subtidal coarse sediment, Subtidal sand, and Subtidal mixed sediments features noted to be exposed to moderate levels of pressure from the activities, for which they are considered to be highly vulnerable. The SACO also notes that the infrastructure includes the placement of protection materials involving either rock placement or concrete mattresses, and regard this to represent some habitat loss and change to sediment type. The SACO also refers to the creation of drill cuttings piles but these do not generally occur in the southern North Sea due to the shallow nature of the area, current strength, and wave action, and so effects from cuttings are highly likely to be only temporary in nature. In addition to oil and gas activity, fisheries (specifically benthic trawling and dredging)

[30] https://www.gov.uk/guidance/oil-and-gas-environmental-statements-reviewed
[31] https://hub.jncc.gov.uk/assets/d439f5d1-5440-4547-84fb-8bd6ec970e44#HoldernessOffshore-SACO-V1.0.pdf

are considered to impact the site. The SACO notes that current oil and gas activities do not overlap the known extent of ocean quahog in the site, but that there may have been some effects from pipeline installation, though pressure from demersal trawling and dredging are considered to be more significant. Export cables for offshore wind farms in the area have, to date, avoided interaction with the Holderness Offshore MCZ, and there are no aggregate extraction areas within the site. While a significant portion of Holderness Offshore MCZ is covered by SNS Area 3, there is also a significant portion of the area applied for which is outside of the site boundaries within which a rig could be sited, avoiding any interaction with the site. The physical disturbance caused by rig placement is considered to represent only a temporary effect on the site, and the dispersal of any cuttings (and the reported effects of drilling discharges, see Section 5.9 of BEIS 2022a and Section 4.4 of BEIS 2022b), would similarly be temporary, and would not hinder the ability of the site to meet its conservation objectives. Should stabilisation material be required for rig placement, this would be in the order of 0.001-0.004km^2 per rig siting, or where the two wells related to SNS Area 3 drilled in the site, up to 0.008km^2, this would represent 0.0007% of the overall site area. There is the potential for further mitigation through the use of removable stabilisation materials, subject to these meeting the technical and safety requirements of rig placement at a particular location. In view of the temporary nature of the impact of rig placement on the Holderness Offshore MCZ, and the available mitigation which includes rig siting and alternative stabilisation methods, it is not considered that the licensing of SNS Area 3 would result in cumulative effects which could significantly hinder the achievement of the site's conservation objectives. Note that the issue of a licence only provides exclusivity to the applicant for exploration and appraisal activities, it does not provide any form of consent for activities to take place. Consent for drilling activities will be subject to further assessment.

Export cables for the Sheringham Shoal and Dudgeon offshore wind farms cross the western part of the Cromer Shoal Chalk Beds MCZs, and the site's SACO indicates that the extent and distribution of some features (subtidal chalk, high/moderate energy circalittoral/infralittoral chalk) has already been reduced by power cables which have been trenched through the features, though the targets for the attribute are set to maintain the extent and distribution. An assessment undertaken by the applicant concluded that the installation, operation and decommissioning of the project would not hinder the conservation objectives of the site[32], however, following consultation feedback, a Stage 2 assessment was undertaken on a precautionary and without prejudice basis, should it be needed during consenting. Such an assessment involves the identification of measures of equivalent environmental benefit (MEEB) to offset the damage caused by the proposed project; for the Sheringham and Dudgeon project, the MEEB proposed is for the creation and maintenance of an oyster bed of 10,000m^2. As the project is still in examination, it is not clear whether the measures would be required, and if they are, what form they could take.

There are proposals in place for landfalls associated with Hornsea Project Three and export cable agreement areas associated with Norfolk Vanguard/Boreas in the west and east of the site respectively. An assessment under Section 125 of the MCAA was undertaken for the Hornsea Three export cable and landfall[33]. Impacts were identified for the sandwave features of the MCZ related to sandwave clearance and cable protection, however, overall it was concluded that although the duration of effects would be for the lifetime of the project, that they

[32] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010109/EN010109-000456-5.6%20Stage%201%20Cromer%20Shoal%20Chalk%20Beds%20Marine%20Conservation%20Zone%20Assessment.pdf

[33] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010080/EN010080-003267-EN010080%20Hornsea%20Three%20-%20Habitats%20Regulations%20Assessment.pdf

would be reversible as on decommissioning all project-related infrastructure would be removed. It was concluded that the conservation objectives of the site would not be significantly hindered by the installation and operation of the export cable. The landfall for Norfolk Boreas and Norfolk Vanguard was chosen to avoid the Cromer Shoal Chalk Beds MCZ, and so effects on the site from these projects were discounted during consenting[34]. A number of pipelines cross the Cromer Shoal Chalk Beds MCZ on their way to the Bacton gas terminal, including those associated with the Shearwater, Esmond, Clipper, Leman and Hewett fields, some of which are subject to decommissioning planning. These pipelines were present in advance of the MCZ being proposed and designated, and no further pipelines are currently proposed to cross the site. For the majority of attributes listed in the site's SACO, a target has been set to maintain the features, often due to a lack of evidence of impacts from anthropogenic activities. As the SNS Area 4 is at least 6.4 km away from the site, the distance within which effects are predicted to occur from the siting of a rig and any related discharges (500m), and their temporary effect, it is not considered that the licensing of SNS Area 4 would result in cumulative effects which could significantly hinder the achievement of the site's conservation objectives.

Seven Blocks have been applied for in the 33rd seaward licensing round[35], which cover parts of the Holderness Offshore MCZ (47/3k, 47/7b, 47/8a, 47/9a, 47/10c, 47/14, 47/15), with one Block partly overlapping Holderness Inshore MCZ (47/7b). Activities associated with the work programmes for these Blocks covers the initial term of the licences, and is analogous to the activities covered in this assessment which relate to the exploration/appraisal terms of carbon dioxide storage licences. In view of the distance between these Blocks, and also the conclusions set out in Section 5.2.2 and those above in relation to other projects, it is not considered possible that the licensing of SNS Area 4 would hinder the achievement of the conservation objectives of the Cromer Shoal Chalk Beds MCZ. There is the potential for cumulative effects to be generated from the licensing of those Blocks that overlap Holderness Inshore MCZ and Holderness Offshore MCZ, though with the exception of Block 47/9a, there is considerable area outside of these Blocks within which rig siting could take place, avoiding any interaction with the site. The potential cumulative impacts from pressures including penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion, from rig siting would be temporary and spatially limited. Any permanent change in habitat type from the placement of rig stabilisation materials would be minor and subject to assessment at the project level – note that a separate MCZ/MPA assessment has been undertaken for the 33rd seaward licensing round, which highlights the same mitigation measures referred to in Section 5.1.2 (removable rig stabilisation, where possible).

It is not considered that any of the Round 4 preferred projects have the potential to act cumulatively with the licensing of SNS Area 3 and SNS Area 4 such that the conservation objectives of the West of Walney MCZ or Fylde MCZ would be hindered due to the lack of any spatial overlap between the areas and the sites, and also a likely lack of any temporal overlap. An MCZ assessment undertaken as part of the Round 4 process (NIRAS 2022) included a consideration of cable route regions for each of the projects. The assessment noted that a meaningful assessment of export cabling could not be undertaken and that the results of the assessment were therefore indicative, and inferred the potential outcome of project level assessment, should interactions with relevant MCZs occur. It was concluded that, provided a

[34] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010079/EN010079-004458-NORV-SoS-decision-letter.pdf, https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010087/EN010087-002917-NORB-Boreas-Decision-Letter.pdf

[35] https://www.gov.uk/guidance/offshore-energy-strategic-environmental-assessment-sea-an-overview-of-the-sea-process#appropriate-assessment

number of interventions could be realised (a set of high level mitigation measures related to risk scores assigned to site features), that there would be no significant risk of Round 4 hindering the achievement of the conservation objectives for the MCZs screened into the assessment, which included Holderness Inshore and Offshore MCZs and Cromer Shoal Chalk Beds MCZ.

It is concluded that none of the potential cumulative effects identified in relation to SNS Area 3 and SNS Area 4 would hinder the conservation objectives of Holderness Inshore MCZ, Holderness Offshore MCZ or Cromer Shoal Chalk Beds MCZ being achieved.

5.2 Eastern Irish Sea

As noted in Section 4, the source of effect relevant to the eastern Irish Sea sites screened in was for physical disturbance and marine discharges related to exploration/appraisal well drilling. The following sections provide a description of the relevant sites followed by an assessment of the potential for the pressures associated with drilling and discharges to hinder the achievement of site conservation objectives.

5.2.1 Relevant sites

West of Walney MCZ[36]

The West of Walney Marine Conservation Zone (MCZ) is located in the Irish Sea, 8 km west of Walney Island off the Cumbrian coast. The site covers an area of 388km^2 in mainly inshore, but also offshore waters, and partly overlaps the Ormonde and Walney offshore windfarms. The site contains two distinct broad-scale habitats; subtidal mud is the most extensive protected feature, and is part of the wider Irish Sea mud belt, and subtidal sand, which occurs over a far smaller area of the site. The subtidal mud is an important habitat for a range of animals including worms, molluscs, sea urchins, crustaceans, including the commercially important Norway lobster and sea-pens.

Sea-pen and burrowing megafauna communities occur on the subtidal mud habitats and are listed as a habitat of conservation importance and are a protected feature. Collectively these animals create a network of burrows and tunnels, helping to shelter other small creatures and allow oxygen to penetrate deeper into the sediment. The distribution and extent of sea-pens within the MCZ and the eastern Irish Sea as a whole is not well understood. There are five records of *Virgularia mirabilis* from grab samples across the southern half of the site, but their presence is considered to be rare (Titan environmental surveys 2005, Centre for Marine and Coastal Studies Ltd, 2009).

The subtidal sands within the MCZ support high densities of burrowing brittle stars (*Amphiura filiformis*), horseshoe worms (*Phoronis* spp.) and polychaete worm (*Scalibregma inflatum*), bivalves (*Kurtiella bidentata* and *Chamelea striatula*), and crustaceans (*Corystes cassivelaunus*). Fish typically associated with this sandy sediment within the Irish Sea include solenette (*Buglossidium luteum*), plaice (*Pleuronectes platessa*), dab (*Limanda limanda*), and sole (*Solea solea*).

[36] Site description based on: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0045, Irish Sea Conservation Zones Regional Report: http://publications.naturalengland.org.uk/publication/1562384

The *West of Walney Marine Conservation Zone (Specified Area) Bottom Towed Fishing Gear Byelaw 2018* was made by the MMO which prohibits the use of bottom towed fishing gear across most of the site.

Fylde MCZ[37]

Fylde MCZ is in Liverpool Bay between 3 and 20km off the Fylde coast and Ribble Estuary, covering an area of 260km^2 of subtidal mud and sand habitats. These sediment features are considered to be good representatives of the seabed habitats and communities found on the eastern side of Liverpool Bay. The water depths within the site range from almost being exposed on low tide to 22m at its deepest.

The MCZ is adjacent to the Shell Flat sandbank, part of the Shell Flat and Lune Deep Special Area of Conservation (SAC). The site is within the Liverpool Bay Special Protection Area (SPA), designated for birds including wintering common scoter (*Melanitta nigra*), red-throated diver (*Gavia stellata*), little gull (*Hydrocoloeus minutus*), breeding common tern (*Sterna hirundo*), little tern (*Sternula albifrons*), and their supporting habitats.

Subtidal sand is dominant in the southern half of the MCZ and the benthic community is characterised by species ranging from a low-abundance bivalve-dominated community including *Corbula gibba*, *Chamelea striatula* and *Dosinia* sp., to a mixed polychaete and bivalve community which includes *Ophelia* sp., *Kurtiella bidentata* and *Glycera tridactyla* (EA 2015). The bivalve fauna also includes *Nucula nitidosa*, *Pharus legumen* and *Abra alba*. The site also includes important nursery and spawning grounds for several commercially important fish species including sole (*Solea solea*), plaice (*Pleuronectes platessa*) and whiting (*Merlangius merlangus*).

5.2.2 Assessment

The conservation objectives of relevant sites and information on site selection and advice on operations have been considered against the work programme for the areas applied for to determine whether site conservation objectives could be hindered. The results are given in Table 5.4 below. All mandatory control requirements (Section 3.4), are assumed to be in place as a standard for all activities assessed.

Table 5.4: Consideration of potential physical disturbance and drilling effects and relevant site conservation objectives

West of Walney MCZ[38]
Site Information
Area (ha/km^2): 38,800/388 **Designated features**: Sea-pen and burrowing megafauna communities, Subtidal mud, Subtidal sand **Conservation objectives**: The conservation objective is that the protected habitats: • Are maintained in favourable condition if they are already in favourable condition; • Be brought into favourable condition if they are not already in favourable condition. For each protected feature, favourable condition means that, within the MCZ: • Its extent is stable or increasing;

[37] Site description based on: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0007, Irish Sea Conservation Zones Regional Report: http://publications.naturalengland.org.uk/publication/1562384

[38] https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0045

- Its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate.

Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.

Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.

Relevant licence areas with potential for physical disturbance and drilling effects

EIS Area 1

Activities associated with the proposed work programmes within the relevant licence areas

Drilling up to one well involving - siting of rig, drilling discharges

Assessment of effects on site integrity

Rig siting
(**Relevant pressures:** *penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion; physical change (to another sediment/seabed type), introduction or spread of non-indigenous species*)

The closest boundary of EIS Area 1 is 750km from the West of Walney MCZ, and direct physical impacts on any of the site's protected features are not considered to be possible noting the assumed distance from a jack-up rig within which effects may occur (500m, see Table 2.1). There may be a requirement for rig stabilisation depending on local seabed conditions. In soft sediments, deposited rock may cover existing sediments resulting in a physical change (to another seabed type) of a scale in the order of 0.001-0.004km^2 per rig siting, and the site's protected features are considered to be sensitive to this pressure, which assumes a permanent change of habitat. As noted above, the assumed distance from a jack-up rig within which effects may occur (500m) is less than the distance between EIS Area 1 and the West of Walney MCZ.

Management of the spread of non-native species from vessels and rigs is being progressed through international measures, and the risk is limited by the operational range of rigs on the UKCS.

Drilling discharges
(**Relevant pressures:** *abrasion/disturbance of the substrate on the surface of the seabed; habitat structure changes - removal of substratum (extraction*), *contaminants, smothering and siltation rate changes)*

The advice on operations indicates that the relevant qualifying features are sensitive to the above pressures, most of which relate to seabed disturbance and habitat changes associated with smothering by drill cuttings near the well location, and that these cuttings can accumulate in piles where currents are generally weak. It is assumed that effects relating to drilling discharges occur within 500m of the well location (Table 2.1), therefore, drilling discharges will not impact the extent, structure, and function of the protected habitats.

Cumulative effects
Intra-plan cumulative effects are not considered to be possible as only EIS Area 1 was identified as relevant to the assessment and only one related work programme has been proposed. Section 5.2.3 provides a consideration of potential cumulative effects with other projects.

Conclusion
The siting of a rig in EIS Area 1 will not hinder the achievement of the West of Walney MCZ site conservation objectives.

Fylde MCZ[39]

Site Information

Area (ha/km^2): 26,060/261
Designated features: Subtidal sand, subtidal mud

Conservation objectives:
The conservation objective is that the protected habitats:

[39] https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0007

- Are maintained in favourable condition if they are already in favourable condition;
- Be brought into favourable condition if they are not already in favourable condition.

For each protected feature, favourable condition means that, within the MCZ:

- Its extent is stable or increasing;
- Its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate.

Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.

Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.

Relevant licence areas with potential for physical disturbance and drilling effects

EIS Area 1

Activities associated with the proposed work programmes within the relevant licence areas

Drilling up to one well involving - siting of rig, drilling discharges

Assessment of effects on site integrity

Rig siting

(**Relevant pressures:** *penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion; physical change (to another sediment/seabed type), introduction or spread of non-indigenous species*)

EIS Area 1 is some 9.5km to the west of Fylde MCZ, and direct physical impacts on any of the site's protected features are not considered to be possible noting the assumed distance from a jack-up rig within which effects may occur (500m, see Table 2.1).

Management of the spread of non-native species from vessels and rigs is being progressed through international measures, and the risk is limited by the operational range of rigs on the UKCS.

Drilling discharges

(**Relevant pressures:** *abrasion/disturbance of the substrate on the surface of the seabed; habitat structure changes - removal of substratum (extraction*), *contaminants, smothering and siltation rate changes)*

The advice on operations indicates that the relevant qualifying features are sensitive to the above pressures, most of which relate to seabed disturbance and habitat changes associated with smothering by drill cuttings near the well location, and that these cuttings can accumulate in piles where currents are generally weak. It is assumed that effects relating to drilling discharges occur within 500m of the well location (Table 2.1), therefore, drilling discharges will not impact the extent, structure, and function of the protected habitats.

Cumulative effects

Intra-plan cumulative effects are not considered to be possible as only EIS Area 1 was identified as relevant to the assessment and only one related work programme has been proposed. Section 5.2.3 provides a consideration of potential cumulative effects with other projects.

Conclusion

The siting of a rig in EIS Area 1 will not hinder the achievement of the Fylde MCZ site conservation objectives.

5.2.3 Cumulative effects

There are a number of potential interactions between activities that may follow licensing and those existing or planned activities, for instance in relation to renewable energy, offshore oil and gas and gas storage (including carbon dioxide storage), fishing, and aggregate extraction. These activities are subject to individual permitting or consenting mechanisms or are otherwise managed at a national level. Interactions were identified on the basis of the nature and location of existing or proposed activities and spatial datasets in a GIS. Projects relevant to

this in-combination effects assessment, along with their status and relevant sites are tabulated in Table 5.5.

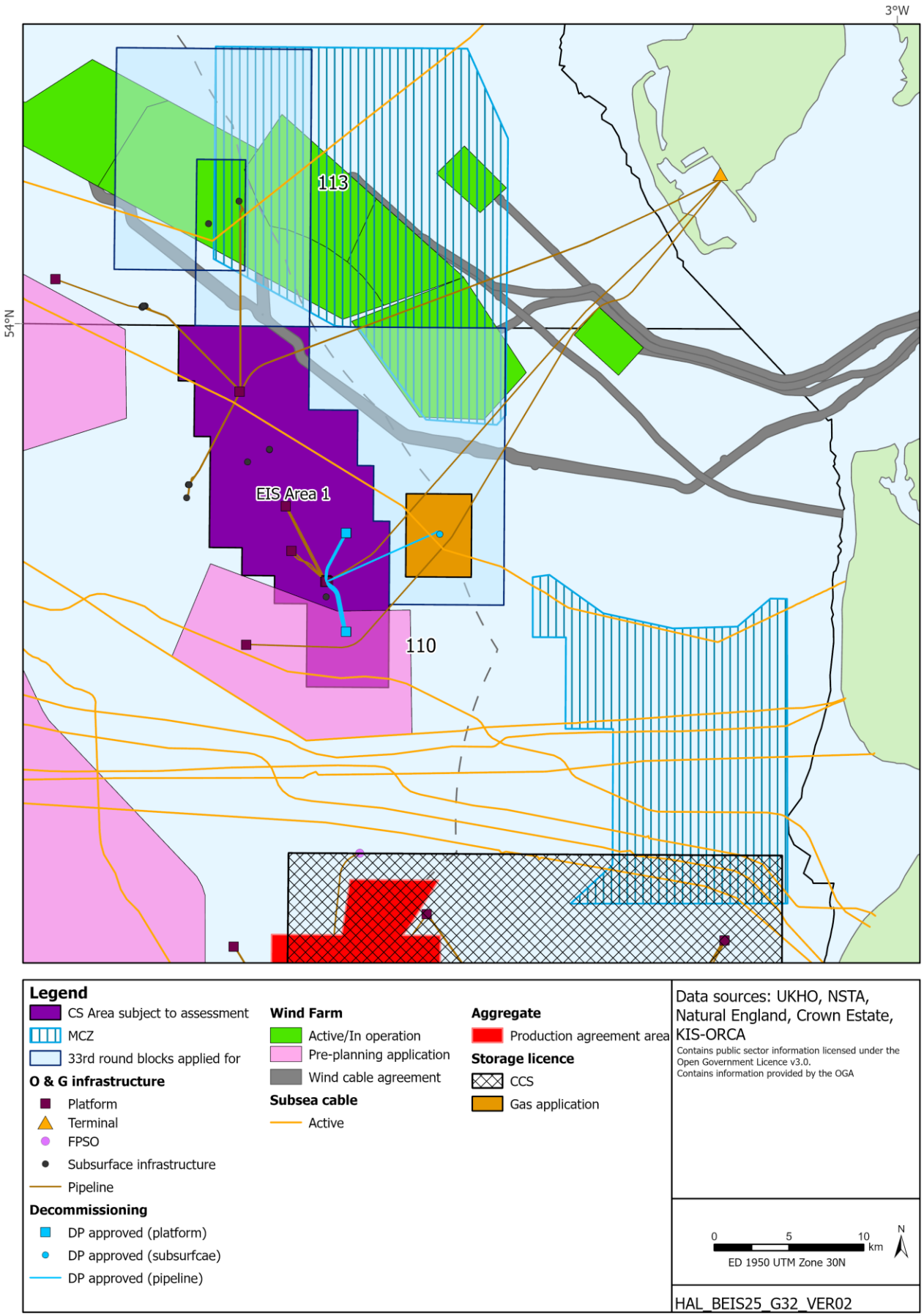
The area applied for is within the North West Inshore and Offshore Marine Plan areas. The North West Marine Plans include a policy in support of carbon capture and storage (NW-CCUS-3) that, "*Proposals associated with the deployment of low carbon infrastructure for industrial clusters should be supported*", and like the East Marine Plans, include separate policies covering co-existence and co-location of developments NW-CO-1) that seek to ensure that space is optimised and outline what must be demonstrated in proposals should they have likely significant impacts on existing activities.

Table 5.5: Projects relevant to the cumulative effects assessment for the eastern Irish Sea

Relevant project	Project summary	Project status/indicative timing	Relevant sites[1]
Walney offshore wind farm	Located approximately 14km from the Cumbrian coast, the project area contains 101 turbines with an overall installed capacity of 367MW. The export cable landfalls are near Heysham and Fleetwood.	In-operation	West of Walney MCZ
Walney extension offshore wind farm	Located approximately 19km from the Cumbrian coast, and to the north west of the Walney I and II windfarms, the extension is due to have an installed capacity of 659MW generated from 87 turbines. The export cables are routed to the south of the Walney and West of Duddon Sands wind farms, with a landfall near Heysham.	In-operation	West of Walney MCZ
West of Duddon Sands offshore wind farm	West of Duddon Sands is located approximately 14km offshore, and contains 108 turbines, with an overall installed capacity of 389MW. The export cable landfall is at Heysham.	In-operation	West of Walney MCZ
Ormonde offshore wind farm	Located approximately 9km offshore, the wind farm contains 30 wind turbines, a sub-station, meteorological mast and inter-array cabling, with an installed capacity of 150MW.	In-operation	West of Walney MCZ
Carbon Storage Licence CS004	The carbon storage licence was awarded in 2020 for an appraisal period of six years, with site characterisation due to be completed by 2023.	Pre-planning	Fylde MCZ
Bains gas storage licence	A gas storage licence was applied for in June 2022 covering the depleted Bains gas storage field. No other details of the proposed work programme are known.	Pre-planning	Fylde MCZ
Pipelines related to the Morecambe and North Morecambe gas fields	North Morecambe 36" pipeline, South Morecambe 36" pipeline, Rhyl control umbilical and flexible export pipeline, Rhyl North subsea wellheads.	In-operation	West of Waney MCZ
33rd seaward oil & gas licensing round	Two Blocks in the Irish Sea (110/3b, 113/27c) have been applied for and are relevant to the assessment. Activities as part of their work programmes include the drilling of wells.	Areas have been applied for and are not yet licensed.	West of Walney MCZ, Fylde MCZ
Round 4 wind preferred projects (export cables)	The route of any export cable associated with these projects is uncertain. The assessment is informed by the Round 4 MCZ assessment.	Pre-planning	West of Walney MCZ, Fylde MCZ

Sources: NSTA carbon storage public register (https://www.nstauthority.co.uk/licensing-consents/carbon-storage/), TCE Open Data Portal (https://thecrownestate.maps.arcgis.com/apps/webappviewer/index.html?id=b7f375021ea845fcabd46f83f1d48f0b, BEIS oil & gas: decommissioning of offshore installations and pipelines (https://www.gov.uk/guidance/oil-and-gas-decommissioning-of-offshore-installations-and-pipelines)
Notes: [1]those sites considered to be relevant to 1st carbon dioxide storage round exploration/appraisal activities.

Figure 5.2: Location of areas applied for in relation to other projects in the Eastern Irish Sea



Physical disturbance and drilling effects

The features protected by West of Walney MCZ and Fylde MCZ are benthic habitats, and are therefore only considered to be sensitive to those physical effects related to the work programme for EIS Area 1, as already assessed in relation to the sites in Section 5.2.2. The conclusions of that section are considered here in the context of those relevant projects identified in Table 5.5 above.

The Ormonde, West of Duddon Sands, Walney and Walney extension wind farms are located within the West of Walney MCZ. These projects were consented and/or completed at the time the site was designated, and the southern portion of the site was co-located with these projects (Irish Sea Conservation Zones 2011). The SACO for the MCZ notes that post-construction surveys of the Walney wind farms indicate sediments have become muddier in the site, which may be the result of a combination of natural factors and the presence of the wind farm. In addition to wind farms, some historical disturbance to the site has occurred from the installation of gas field pipelines, including the South Morecambe and North Morecambe export pipelines, and the pipelines and umbilicals associated with the Rhyl field. The SACO notes that the protected features are sensitive to fisheries, and in particular *Nephrops* fisheries and the regular use of bottom towed fishing gear in the site. A 2018 bylaw prohibits the use of bottom towed gear across most of the MCZ other than under licence, which should have made significant progress in reducing this fisheries pressure. While the target for the attributes relating to the distribution of the site's protected features is to recover the presence and spatial distribution of the features, in view of the location of EIS Area 1 relative to the site (at least 750m away), the distance within which effects are predicted to occur from the siting of a rig and any related discharges (500m), and their temporary effect, it is not considered that the licensing of EIS Area 1 would result in cumulative effects which could hinder the achievement of the site's conservation objectives.

The Fylde MCZ is not subject to significant pressures from activities involving physical disturbance in the eastern Irish Sea, including energy related infrastructure and aggregates extraction, and so it is not considered possible for any cumulative effects with these activities and the licensing of EIS Area 1 to occur. Carbon Storage licence area CS004 overlaps the southern portion of the site. As noted in Table 5.5, the appraisal work programme covered by this licence should be complete in 2023, and therefore any potential temporal overlap with activities associated with EIS Area 1 is not expected. Hynet North West, to which CS004 relates, is one of the Track-1 clusters associated with the Government's programme to deploy Carbon Capture Usage and Storage in a minimum of two industrial clusters by the mid-2020s and four by 2030, however, the nature and timing of any subsequent carbon dioxide storage within CS004 is not yet known. The SACO does not provide any further evidence for anthropogenic activities which are affecting the site, though it is likely that fisheries will be exerting some pressure. In view of the location of EIS Area 1 relative to the site (at least 9.5km away), the distance within which effects are predicted to occur from the siting of a rig and any related discharges (500m), and their temporary effect, it is not considered that the licensing of EIS Area 1 would result in cumulative effects which could significantly hinder the achievement of the site's conservation objectives.

It is not considered that any of the Round 4 preferred projects have the potential to act cumulatively with the licensing of EIS Area 1 such that the conservation objectives of the West of Walney MCZ or Fylde MCZ would be hindered as there is no spatial overlap between the areas and the sites, and also a likely lack of any temporal overlap. An MCZ assessment undertaken as part of the Round 4 process (NIRAS 2022) included a consideration of cable

route regions for each of the projects. The assessment noted that a meaningful assessment of export cabling could not be undertaken and that the results of the assessment were therefore indicative, and inferred the potential outcome of project level assessment, should interactions with relevant MCZs occur. It was concluded that, provided a number of interventions could be realised (a set of high level mitigation measures related to risk scores assigned to site features), that there would be no significant risk of Round 4 hindering the achievement of the conservation objectives for the MCZs screened into the assessment, which included West of Walney and Fylde MCZs.

Two Blocks applied for in the 33rd seaward licensing round[40] cover parts of the West of Walney MCZ, and one (110/3b) is some 2km from Fylde MCZ; activities that could follow the licensing of these Blocks is subject to a separate MCZ/MPA assessment. Activities associated with the work programmes for these Blocks covers the initial term of the licences, and is analogous to the activities covered in this assessment which relate to the exploration/appraisal terms of carbon dioxide storage licences. In view of the distance between Block 110/3b and Fylde MCZ, and also the conclusions set out in Section 5.2.2 and those above in relation to other projects, it is not considered possible that the licensing of EIS Area 1 would hinder the achievement of the site's conservation objectives. While Blocks 110/3b and 113/7c cover parts of the West of Walney MCZ, the area of 110/3b that covers the site also covers the West of Duddon Sands offshore wind farm, and so placement of a rig within this area is highly unlikely and cumulative effects and not considered possible. Similarly, much of the overlap of Block 113/7c is within the co-location area for the Walney and Walney extension offshore wind farms, and there remains a considerable portion of the Block outside of the site within which a rig could be sited. In view of the lack of any direct impact on West of Walney MCZ from the licensing of EIS Area 1 (see Section 5.2.2), the spatial separation of activities that could occur within Block 113/7c and EIS Area 1 should they be licensed, and the typical durations of the initial/exploration terms of the licences (e.g. likely to be between six and eight years), are such that temporal overlap is also extremely unlikely.

It is concluded that none of the potential cumulative effects identified in relation to EIS Area 1 would hinder the conservation objectives of West of Walney MCZ or Fylde MCZ being achieved.

[40] https://www.gov.uk/guidance/offshore-energy-strategic-environmental-assessment-sea-an-overview-of-the-sea-process#appropriate-assessment

6 Conclusion

It is concluded that the licensing of the areas applied for in the 1st carbon storage licensing round, and in particular the areas screened in for detailed assessment, will not significantly hinder the achievement of the conservation objectives of relevant MCZs or MPAs.

Even where a site/protected feature has been screened out, or where it was concluded that the licensing will not hinder the conservation objectives of a site being achieved at plan level, the potential for significant risk of a future act hindering the achievement of the conservation objectives on any relevant site would need to be revisited at the project level, once project plans are known, and as part of project specific consenting. New relevant site designations, extensions or the addition of protected features, new information on the nature and sensitivities of protected features within sites, and new information about effects including cumulative effects, may be available to inform such future assessments.

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Appendix A – The Designated Sites

The following tables list the sites relevant to each area and their protected features with respect to the areas applied for in the 1st carbon storage licensing round. The sources of site data were the JNCC[41], Natural England[42], NatureScot[43] and Historic Environment Scotland[44] websites. These sites are mapped against the areas applied for in the 1st carbon dioxide storage licensing round in Figure 2.1 to Figure 2.3.

Table A.2: Relevant sites and their designated features

Site Name	Area (ha)	Designated features
CENTRAL AND NORTHERN NORTH SEA		
North-east Faroe Shetland Channel MPA	2,368,200	Quaternary of Scotland, Submarine Mass Movement, Cenozoic Structures of the Atlantic Margin, Continental slope, Deep sea sponge aggregations, Marine Geomorphology of the Scottish Deep Ocean Seabed, Offshore deep sea muds, Offshore subtidal sands and gravels
Faroe-Shetland Sponge Belt MPA	527,800	Continental slope, Deep sea sponge aggregations, Marine Geomorphology of the Scottish Deep Ocean Seabed, Offshore subtidal sands and gravels, Submarine Mass Movement, Quaternary of Scotland, Ocean quahog aggregations (*Arctica islandica*)
Fetlar to Haroldswick MPA	21,600	Black guillemot (*Cepphus grylle*), Horse mussel beds, Maerl beds, Shallow tide-swept coarse sands with burrowing bivalves, Circalittoral sand and coarse sediment communities, Kelp and seaweed communities on sublittoral sediment, Marine Geomorphology of the Scottish Shelf Seabed
Mousa to Boddam MPA	1,300	Marine Geomorphology of the Scottish Shelf Seabed, Sandeels (*Ammodytes marinus*/*Ammodytes tobianus*)
Out Skerries HMPA	-	Wrecks of the *Kennemerland* and *Wrangels Palais.*
North-west Orkney MPA	436,500	Marine Geomorphology of the Scottish Shelf Seabed, Sandeels (*Ammodytes marinus*/*Ammodytes tobianus*)
Papa Westray MPA	3,300	Marine Geomorphology of the Scottish Shelf Seabed, Black guillemot (*Cepphus grylle*)
Wyre and Rousay Sounds MPA	1,600	Kelp and seaweed communities on sublittoral sediment, Marine Geomorphology of the Scottish Shelf Seabed, Maerl beds
West Shetland Shelf MPA	408,300	Offshore subtidal sands and gravels
Central Fladen MPA	92,500	Burrowed mud, Quaternary of Scotland
Noss Head MPA	800	Horse mussel beds
East Caithness Cliffs MPA	11,400	Black guillemot (*Cepphus grylle*)
Southern Trench MPA	239,800	Burrowed mud, Shelf deeps, Fronts, Submarine Mass Movement, Quaternary of Scotland, Minke whale (*Balaenoptera acutorostrata*)
Turbot Bank MPA	25,100	Sandeels (*Ammodytes marinus*/*Ammodytes tobianus*)
Norwegian Boundary Sediment Plain MPA	16,400	Offshore subtidal sands and gravels, Ocean quahog aggregations (*Arctica islandica*)
East of Gannet and Montrose Fields MPA	183,900	Offshore subtidal sands and gravels, Offshore deep sea muds, Ocean quahog aggregations (*Arctica islandica*)
SOUTHERN NORTH SEA		
Farnes East MCZ	94,500	Moderate energy circalittoral rock, Subtidal coarse sediment, Subtidal sand, Subtidal mud, Subtidal mixed sediments, Sea-pen and burrowing megafauna communities, Ocean quahog (*Arctica islandica*)

[41] https://jncc.gov.uk/our-work/marine-conservation-zones/

[42] https://designatedsites.naturalengland.org.uk/

[43] https://sitelink.nature.scot/home

[44] http://portal.historicenvironment.scot/

Site Name	Area (ha)	Designated features
Berwick to St Mary's MCZ	63,423	Common eider (*Somateria mollissima*)
Aln Estuary MCZ	39	Coastal saltmarshes and saline reedbeds, Intertidal mud, Estuarine rocky habitats, Sheltered muddy gravels
Coquet to St Mary's MCZ	19,188	High energy infralittoral rock, High energy intertidal rock, Intertidal coarse sediment, Intertidal mixed sediments, Intertidal mud, Intertidal sand and muddy sand, Intertidal under boulder communities, Low energy intertidal rock, Moderate energy circalittoral rock, Moderate energy infralittoral rock, Moderate energy intertidal rock, Peat and clay exposures, Subtidal coarse sediment, Subtidal mixed sediments, Subtidal mud, Subtidal sand
North East of Farnes Deep MCZ	49,200	Subtidal coarse sediment, Subtidal sand, Subtidal mixed sediments, Subtidal mud, Ocean quahog (*Arctica islandica*)
North East of Farnes Deep pilot HPMA	49,200	Subtidal coarse sediment, Subtidal sand, Subtidal mixed sediments, Subtidal mud, Ocean quahog (*Arctica islandica*) – note that the features to be subject to protection will be set out in the designation order for the site.
Swallow Sand MCZ	474,600	Subtidal coarse sediment, Subtidal sand, North Sea glacial tunnel valley (Swallow Hole)
Holderness Inshore MCZ	30,887	High energy circalittoral rock, Intertidal sand and muddy sand, Moderate energy circalittoral rock, Subtidal coarse sediment, Subtidal mixed sediments, Subtidal mud, Subtidal sand, Spurn Head (Subtidal; geomorphological interest feature)
Holderness Offshore MCZ	117,600	Subtidal coarse sediment, Subtidal sand, Subtidal mixed sediments, Ocean quahog (*Arctica islandica*); North Sea glacial tunnel valleys (geological interest feature)
Markham's Triangle MCZ	20,000	Subtidal coarse sediment, Subtidal sand, Subtidal mud, Subtidal mixed sediments
Cromer Shoal Chalk Beds MCZ	32,048	High energy circalittoral rock, High energy infralittoral rock, Moderate energy circalittoral rock, Moderate energy infralittoral rock, North Norfolk coast (Subtidal), Peat and clay exposures, Subtidal chalk, Subtidal coarse sediment, Subtidal mixed sediments, Subtidal sand
IRISH SEA		
Cumbria Coast MCZ	1,800	High energy intertidal rock, Honeycomb worm (*Sabellaria alveolata*) reefs, Intertidal biogenic reefs, Intertidal sand and muddy sand, Intertidal under boulder communities, Moderate energy infralittoral rock, Peat and clay exposures, Razorbill (*Alca torda*)
West of Copeland MCZ	15,800	Subtidal coarse sediment, Subtidal sand, Subtidal mixed sediments
West of Walney MCZ	38,800	Sea-pen and burrowing megafauna communities, Subtidal mud, Subtidal sand
Fylde MCZ	26,060	Subtidal sand, subtidal mud
Wyre-Lune MCZ	9,231	Smelt (*Osmerus eperlanus*)
Ribble Estuary MCZ	1,544	Smelt (*Osmerus eperlanus*)