Vattenfall Wind Power Ltd

Thanet Extension Offshore Wind Farm

Appendix 32 to Deadline 5 Submission: SAC and MCZ Clarification Note and Annexes

Relevant Examination Deadline: 5

Submitted by Vattenfall Wind Power Ltd

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Revision A

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Annexes referred in this document

Annex A to Appendix 32	ABPmer technical clarification
Annex B to Appendix 32	MCZ clarification note (Appendix 20 to Deadline 4)
Annex C to Appendix 32	MCZ assessment report (Application ref 6.4.5.3)

1 SAC and MCZ Clarification

1.1 Introduction

1 Following receipt of a request for further information from Natural England the following document has been drafted to provide NE with the information requested, in addition to information requested by the Examining Authority. The following sections are presented according to the questions as received from Natural England and broken down according to the primary receptors of relevance, namely Thanet Coast Special Area of Conservation (SAC), Thanet Coast Marine Conservation Zone (MCZ), and the Goodwin Sands proposed MCZ.

2 This request is broadly reflected in the Examining Authority second questions (ExQ2), and the Action Points that were taken at Issue Specific Hearing (ISH) 8, namely Action Point 10 and elements of Action Point 16. Whilst this note is primarily structured to address the questions raised by Natural England for reference the Action Points and ExQs are as follows:

- **Action Point 10 – Thanet Coast SAC**
  - The Applicant to provide an updated SoCG with Natural England covering HRA conclusions for the reef feature (alone and in-combination) of the Thanet Coast SAC for D5.
- **Action Point 16 – Effects on Goodwin Sands pMCZ**
  - The Applicant to submit a revised MCZ Clarification Note to take account of IP comments for D5;
  - Update dML condition drafting expressly relating to the pMCZ; and
  - Use updated SoCGs at D5 to document the latest position in terms of agreement/outstanding disagreement on MCZ matters.

3 The components of most relevance to this note therefore are Action Point 10 and part 1 of Action Point 16, the remainder of this document seeks to address those Action Points through reference to specific outstanding questions received from Natural England via email on the 12th April 2019. An updated SoCG is anticipated following submission of this document to Natural England.

4 As noted above there is also an appreciable overlap between the Action Points, the request for further information made by Natural England, and the second Examining Authority Questions. Given this apparent overlap this note seeks to address those questions too, which are presented below for ease of reference.

- **ExQ2.14.1 Ramsgate: Maintenance dredging**
  - Can the Applicant please provide a latest position statement on cumulative/ in-combination effects, taking account of the most recent intelligence on this project. If intelligence changes, a final update should also be provided at Deadline 8.
- **ExQ2.14.2 Ramsgate: Capital dredging for new ferry services**
  - Can the Applicant please provide a latest position statement on the possibility of cumulative/ in-combination effects, taking account of the most recent intelligence on this project. If intelligence changes, a final update should also be provided at Deadline 8.

1.2 Suspended sediment and deposition associated with cable laying activities

5 The following section addresses the first of Natural England's questions which is:

We are still unclear of what sediment plumes (and the impacts of suspended sediment increases, and possible smothering) will occur within designated sites as a result of worst case scenario of cable laying activities and how the features within the designated sites will be effected. It should be clear how much deposition is likely to occur within the designated site. This is across a few variables:

- ***What (percentage) area in the site will affected;***
- ***Which features will be affected;***
- ***The percentage of each feature to be affected;***
- ***To what depth will smothering occur and***
- ***For how long.***

6 The response to these specific queries is presented in Table 1 which presents each variable, against the relevant sites, and provides the suite of document references within the application where this information is presented. The underlying assessment of suspended sediment and deposition which informs all subsequent and related assessments is presented in the physical processes technical report and chapter (App ref 6.4.2.1 and 6.2.2 respectively). For ease of reference a technical clarification note accompanies this Deadline 5 submission at Annex A. The note summarises the relevant findings of the wider technical note and chapter.

7 The relevant section of the technical report (Section 3.3 of App ref 6.2.4.1), and Annex A to this Deadline 5 submission, notes that in order to inform the assessment of potential changes to SSC and bed levels arising from construction related activities, a number of spreadsheet based numerical models have been developed for use. Similar models were developed and used to inform the environmental impact assessments for similar activities at Burbo Bank Extension, Walney Extension and Navitus Bay offshore wind farms. This approach was also agreed with members of the technical group under the EIA Evidence Plan (App Ref 8.5) as an appropriate and proportionate approach to undertake for the Thanet Extension EIA.

8 The spreadsheet based numerical models, allows consideration of the potential impacts associated with the extent of plumes of relatively elevated suspended sediment concentration, and the extent of subsequent sediment deposition (caused by sediment disturbance during export cable burial by jetting and associated sandwave levelling by dredging) that might cause smothering to benthic ecology habitats or receptors. This information is presented in Annex A to this Deadline 5 submission, and underpins the clarifications presented within this document.

9 Figure 1 illustrates the project parameters of primary concern, noted as Disposal Site 3, the Thanet Coast SAC, Thanet Coast MCZ, Goodwin Sands pMCZ, and the illustrated extent of the maximum design scenario for suspended sediment and deposition associated with the proposed Thanet Extension cable installation works.

10 Whilst comparable sandwave clearance for cable installation, seabed preparation for foundations, and drilling for foundations, are also proposed within the array area these proposed works are noted not to interact with designated sites, and have not formed the focus of ExQs, ISH Action Points, or requests for further information from Natural England. These works are not therefore considered any further within this Appendix to the Deadline 5 submission with focus instead being on the export cable works.

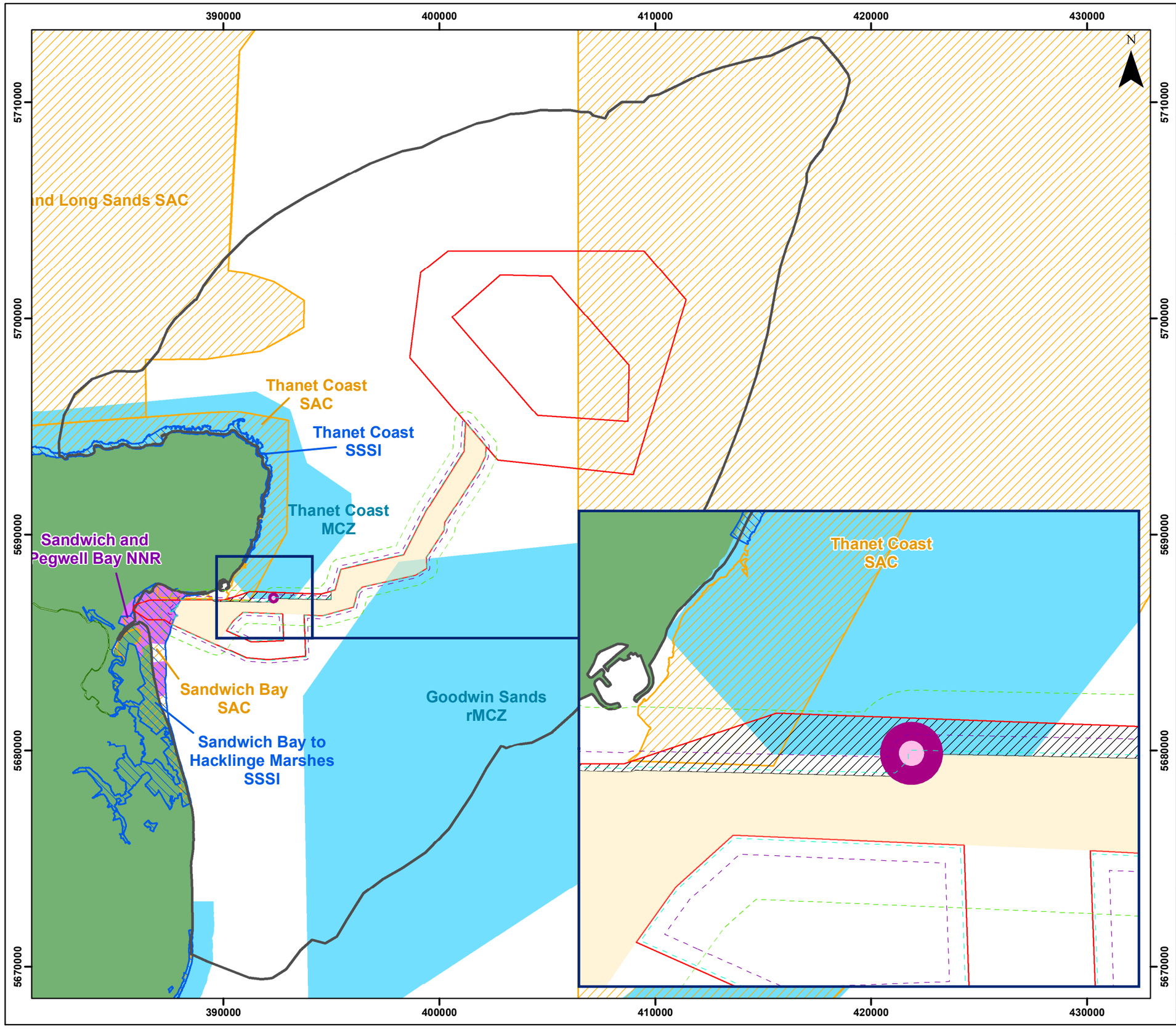

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Figure 1

Designated Sites and Selected Cable Corridor Buffer Distances

Legend

- Cable Corridor - 25 m Buffer
- Cable Corridor - 150 m Buffer
- Example Deposit - 200 m Diameter
- Example Deposit - 500 m Diameter
- TEOW Disposal Site 3
- Sandwave Clearance - 500 m Buffer (maximum distance for sand in suspension)
- Offshore Red Line Boundary
- Cable Exclusion Area
- Spring Tide Excursion Buffer

Designated Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Marine Conservation Zone (MCZ)
- National Nature Reserve (NNR)

Datum: ETRS 1989
Projection: UTM31N

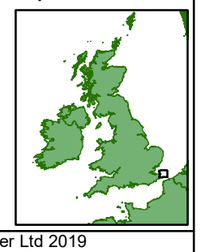

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Table 1 Detailed response to Natural England request for further information

Variable	Document reference	Context	Implications for Goodwin sands pMCZ	Implications for Thanet Coast SAC	Implications for Thanet Coast MCZ
What (percentage) area in the site will affected;	Assessment undertaken in physical processes technical report (App ref 6.4.2.1; Section 3.3 *et seq*) and chapter (App Ref 6.2.2); benthic chapter (App ref 6.2.5; para 5.10.26 *et seq*); RIAA (PINS ref REP2-018; para 11.2.83 *et seq*); MCZ assessment (App ref 6.4.5.3; para 5.6.8 *et seq*)	Due to the low height of release of sediment associated with cable installation, the deposition of materials will be spatially limited to up to approximately 25 m for gravels and up to a few hundred metres for sands. Finer material may be advected over a few thousand metres, but to near background concentrations (tens of mg/l). The distance to which dredged material may spread to an increase in bed level of 5 cm is 150 m from the cable, however it is expected that the extent (and therefore area) of deposition will be smaller for sands and gravels (leading to a greater thickness of tens of	Between 0.01% (discrete location deposition (0.3m) associated with sandwave clearance) and 0.42% (broader scale cable related effects) will be subject to disturbance and sediment deposition. The overlap with the Goodwin Sands pMCZ extends to both the 25m (0.3m deposition buffer) and the 150m (0.05m deposition) buffer. The former amounts to 1.199km^2, whilst the latter amounts to a total area of 1.545km^2. This equates to 0.43% and 0.56% respectively of the 277km^2 site.	The overlap with the Thanet Coast SAC is limited to the '150m' (0.05m deposition) buffer which amounts to a total area of 0.21km^2. This equates to 0.75% of the 28.16km^2 site.	The overlap with the Thanet Coast MCZ extends to both the 25m (0.3m deposition buffer) and the 150m (0.05m deposition) buffer. The former amounts to 0.034km^2, whilst the latter amounts to a total area of 0.18km^2. This equates to 0.05% and 0.29% respectively of the 62.79km^2 site.
Which features will be affected;			Sands and gravels within the RLB to a distance of	Features within 150m of the RLB, which correspond with the	Features within 150m of the RLB, which correspond with the

Variable	Document reference	Context	Implications for Goodwin sands pMCZ	Implications for Thanet Coast SAC	Implications for Thanet Coast MCZ
		centimetres to a few metres near the cable), and that fine material will be distributed more widely, becoming so dispersed that it is unlikely to settle in a measurable thickness.	150m will be subject to deposition.	maintained dredged channel for Ramsgate harbour. These are listed as potential chalk features, but see below for the potential percentage of the habitats that may be affected.	maintained dredged channel for Ramsgate harbour. These are listed as potential chalk features and sands/gravels, but see below for the potential percentage of the habitats that may be affected.
The percentage of each feature to be affected;			0.01% of sands and gravels subject to deposition associated with sandwave clearance (0.3m), 0.42% more broadscale disturbance.	The relevant chalk reef features are beyond the 150m buffer (as presented within the Magic database) and therefore any deposition will be <0.05m, temporary in nature and unlikely to be discernible above baseline conditions	The broadscale features noted within the 25m and 150m zone of influence are listed as patches of subtidal chalk and mixed sediments within the Magic database. It is considered unlikely that the chalk features present will be notable due to the area of overlap coinciding with the maintained/ dredged channel approach to Ramsgate Harbour. Notwithstanding this, assuming a worst case of interaction with the chalk habitat this would represent 0.74% of

Variable	Document reference	Context	Implications for Goodwin sands pMCZ	Implications for Thanet Coast SAC	Implications for Thanet Coast MCZ
					the 24.21km2 of chalk habitat present within the MCZ being subject to 0.05m temporary deposition (0.1% subject to 0.3m). This assessment is overly precautionary as the distribution of habitats appears to be closer to 50-60% mixed sediments according to Magic, and 0% chalk according to the site specific surveys within the RLB. The likely interaction is therefore considered to be closer to 0.35% in the worst case scenario being subject to 0.05m deposition in the event that sandwave clearance works were undertaken at the very periphery of the RLB in an area that is actively dredged by the Ramsgate Harbour maintenance works.

Variable	Document reference	Context	Implications for Goodwin sands pMCZ	Implications for Thanet Coast SAC	Implications for Thanet Coast MCZ
To what depth will smothering occur;			1.5m at 5m distance, decreasing to 0.3m at 25m and 0.05m at 150m distance from activity Due to the expected low height of ejection, the effect of sand and gravels on SSC and deposition will be spatially limited to within metres (up to approximately 5 m) downstream of the cable for gravels and within tens of metres (up to a few hundred metres) for sands (depths of 0.3m and 0.05m at 25m and 150m respectively,	Potentially a depth of 0.3m, although it is noted this is the maximum depth at a distance of 150m, which is likely less than the distance between the disposal site and SAC due to the presence of the cable exclusion zone. Due to the expected low height of ejection, the effect of sand and gravels on SSC and deposition will be spatially limited to within metres (up to approximately 20 m downstream of the cable for gravels) and within tens of metres (up to a few hundred metres) for sands.	A depth of 0.3m, although it is noted this is the maximum depth at a distance of 150m, which is likely less than the distance between the disposal site and MCZ at most locations due to the presence of the cable exclusion zone. Due to the expected low height of ejection, the effect of sand and gravels on SSC and deposition will be spatially limited to within metres (up to approximately 20 m downstream of the cable for gravels) and within tens of metres (up to a few hundred metres) for sands.
For how long.			As noted in the benthic chapter the increase in SSC and deposition associated with foundation seabed preparation will be of temporary and of a short-term duration. It is noted that this location has been chosen for the disposal of		

Variable	Document reference	Context	Implications for Goodwin sands pMCZ	Implications for Thanet Coast SAC	Implications for Thanet Coast MCZ
			dispersive dredged material and therefore disposed material is expected to be regularly re-worked.		
Overall conclusion			No significant effect from the project alone	No adverse effect from the project alone	No significant effect from the project alone

1.3 Deposition associated with sandwave clearance

11 The following section addresses the second of Natural England's questions (and sub-questions) sequentially. For completeness both broadscale deposition associated with general cable installation, and discrete deposition associated with a discrete sandwave clearance and disposal of material activity are considered.

In terms of the worst case scenario, this should be assumed as discrete deposition occurring in locations that pose the most risk. For example:

a. Discrete deposition occurring where the applicant's red line boundary is closest to designated sites and thus features.

b. If the applicant knows where sandwaves occur, then assuming discrete deposition occurs by the sandwaves that are closest to / within designated sites and thus features.

Broadscale deposition

12 For sediment deposition, as the volume of sediment is limited (by the dimensions of the trench or the capacity of the dredger), the maximum average thickness of deposition is calculated directly for a range of realistically possible deposition extents/areas following sudden release of the full dredger hopper load at the chosen spoil disposal location (which would be within Disposal Site 3, which is within the red line boundary, and nearby to the sandwave clearance activities).

13 The distances presented in **Error! Reference source not found.** above consider the worst case of the cable being installed at the nearest location feasible, taking account of the cable exclusion area, to the designated sites. The worst case therefore considers deposition in the immediate/nearfield of 1.5m (in Goodwin sands pMCZ) with more distant effects being more appropriate for Thanet Coast MCZ due to the presence of the cable exclusion area (0.33m at 150m).

14 Figure 1 shows the position of a 25m and 150m buffer outside of the cable corridor boundary, which indicate the maximum distances outside of the red line boundary to which gravel or sand plumes, and/or sediment deposition thicknesses of 0.3m to 0.05m respectively might realistically occur, if the cable is installed at the very edge of the cable corridor, and assuming that the ambient currents are in that direction at the time of the work.

15 As noted in Table 1 it is considered that the level of deposition potentially possible at the Thanet Coast SAC and Thanet MCZ is such that there would be no significant effect on the features present. Whilst a greater level of deposition is possible at the Goodwin Sands pMCZ, the maximum depth of 1.5m is in the immediate nearfield area, out to 0.3m at 25m and 0.05m at 150m, the receiving environment is characterised by sands and gravels which are considered to be not sensitive to smothering.

Sandwave clearance and discrete disposal

16 With regards discrete areas of deposition, associated with sandwave clearance and disposal, whilst it is not possible to determine the exact locations of sandwaves at this stage, due to the migration of sandwaves at seabed level, an assessment has been undertaken on the maximum design scenario which assumes interaction in the SAC/MCZs. It is worthy of note however that as illustrated in Figure 2 (a replication of Figure 2.14 from the Physical Processes chapter (App ref 6.2.2) for ease of reference) that very few sandwaves/crests appear in close proximity to either the Thanet Coast SAC/Thanet Coast MCZ or Goodwin sands pMCZ. The maximum design scenario is therefore considered to be suitably precautionary.

17 Under this scenario it is assumed that sandwaves are located in close proximity to the designated site, or in the case of Goodwin sands pMCZ within it. With regards disposal within Goodwin Sands pMCZ it is noted that this has been requested by Natural England where sandwave clearance is required within the pMCZ. By ensuring the sandwave clearance material is disposed of as near as practicable to any works within the MCZ it is anticipated that this would ensure that the sediment remains within the system of the Goodwin Sands pMCZ. The Applicant notes that the system of relevance to Goodwin sands operates at a far greater scale than the overlap between works and the Goodwin sands pMCZ but recognises Natural England's concerns and has therefore committed to retain sediment as close as practicable, and also to undertake monitoring where sandwave clearance is required within the pMCZ.

18 More broadly, dredging might occur and dredge spoil might be disposed of anywhere within the cable corridor, which is approximately 1km wide or more along most of its length.

19 Figure 1 shows the position of a 150m buffer outside of the cable corridor boundary, and a 500m buffer outside of the dredge disposal area boundary, which can be used to judge the maximum distances (100 to 500m) outside of the dredge disposal area boundary to which sand plumes might realistically occur, if the dredging or spoil disposal occurs at the very edge of the cable corridor, and (in the case of plumes) assuming that the ambient currents are in that direction at the time of the work.

20 Figure 1 also shows the relative size of a 200m and a 500m diameter circular dredge spoil deposit, corresponding to maximum average thicknesses of 0.3m and 0.05m for a full hopper load. The centre of the example deposit is located on the edge of the dredge disposal area and close to a designated area. The shape thereby illustrates the maximum area of impact to the designated area in the unlikely event that the spoil is deposited at the very edge of the dredge disposal area. The maximum distances that circular deposit shapes with these dimensions will extend outside of the dredge disposal area are half the diameter, 100m or 250m, respectively. The 150m buffer line therefore also provides a visual indication of the maximum extent of effect from such discrete deposits elsewhere on the edge of the dredge disposal area.

21 This therefore provides a clear presentation of the potential zones of impact associated with discrete point source and more broadscale deposition as requested by Natural England for the project alone. It demonstrates that at the assessed depths (0.3m out to 100m from the source and 0.05 up to 250m from the source) the likely area of overlap with the Thanet Coast SAC and Thanet Coast MCZ are small in the theoretical case that disposal took place at the periphery of the cable corridor immediately adjacent to the designated sites.

22 In the case of the Goodwin sands pMCZ there is a total area of overlap with the disposal site of 1.13km^2. With regards a discrete point source of disposal with depths of up to 0.05m over an area of 500m diameter, this is a total area of 0.19km^2 which equates to 0.07% of the 277km^2 Goodwin Sands pMCZ being subject to smothering of between 0.05 and 0.3m depth (0.01% specifically to a depth of 0.3m).

The Goodwin Sands rMCZ post survey site report (Cefas, 2015) identifies that subtidal coarse sediment' is the most widespread habitat type, occupying 52% of the rMCZ. 'A5.2 Subtidal sand' occupies 35%, 'A5.4 Subtidal mixed sediments' occupy 9%, and 'A4.2 Moderate energy circalittoral rock' occupies 4% of the rMCZ. Given the Applicant has identified previously that there is no overlap with the circalittoral rock habitats, the overarching group of 'sands and gravels' therefore represent a combined 96% of the total 277km^2 site (265.92km^2). The proposed works therefore may result in a maximum design scenario of 0.01% of the sands and gravels feature being subject to deposition of up to 0.3m.

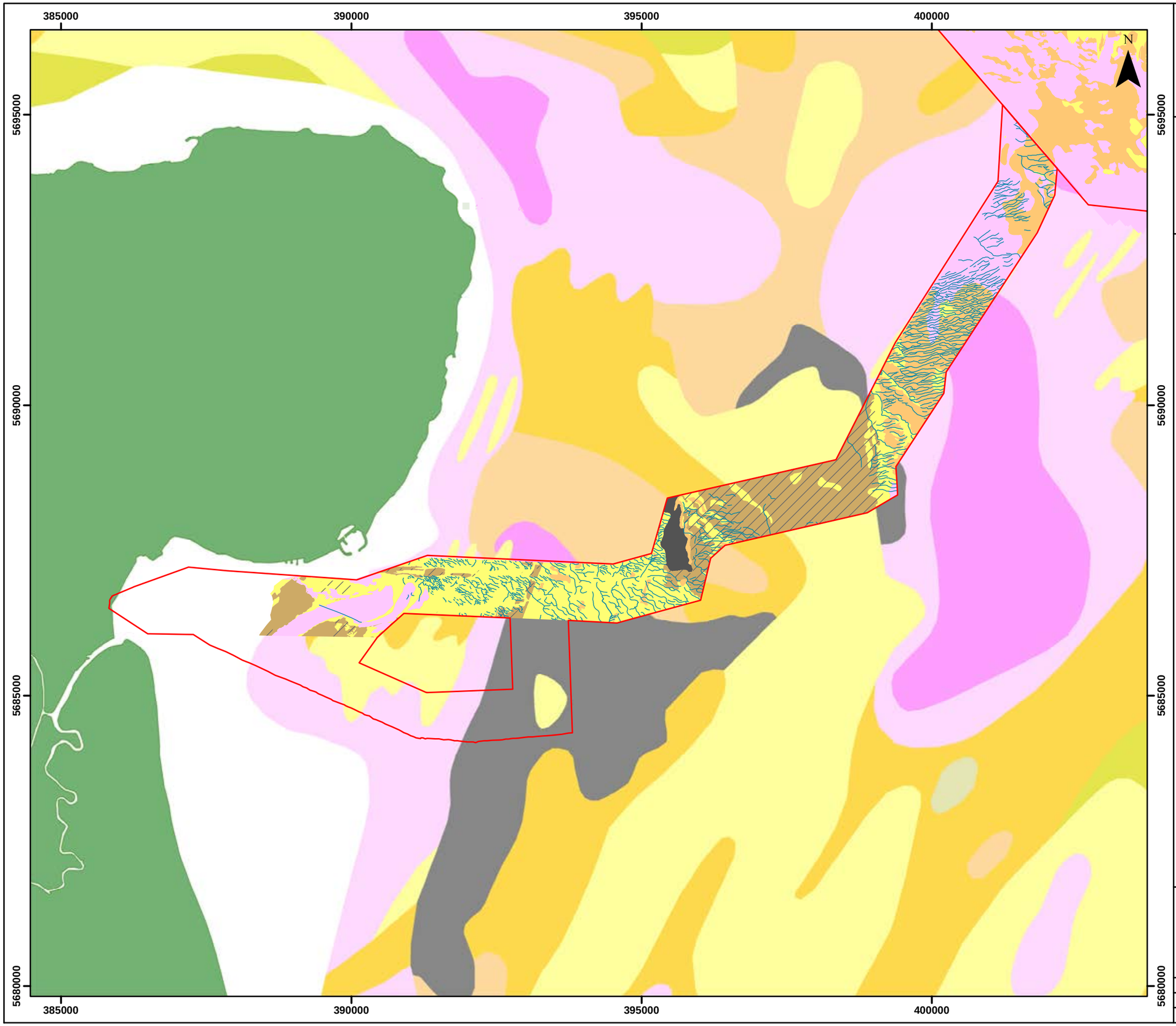

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Figure 2.14

Seabed Sediment and Bedform Distribution Within the Thanet Extension OECC

Legend

- Offshore Red Line Boundary

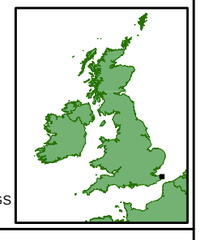
Seabed Sediments

- 'Fine to Coarse Sand' (Fugro, 2016c)
- Gravel
- Gravelly Sand
- Muddy Sand
- Rock
- Sand
- Sandy Gravel
- Slightly Gravelly Muddy Sand
- Slightly Gravelly Sand

Seabed Features

- Small to Medium Sand Waves
- Ridge Crest

Datum: ETRS 1989
Projection: UTM31N



Sediment distribution within the cable corridor from Fugro (2016b); surrounding areas from BGS seabed mapping

1:65,000 0 0.7 1.4 km 0 0.35 0.7 nm

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Figure 2.14

1.4 In-combination effects (Ramsgate Harbour)

The above should be looked at alone, and in combination. For the Ramsgate disposal site, the physical processes chapter does refer to some historic volumes of disposal and concludes that in combination is insignificant. This may be fine, but it needs to be demonstrated in light of the above bulleted variables regarding the impact on designated features (2.13.17 physical processes chapter). The impact on receptors should be assessed in terms of normal environmental fluctuations and sensitivities from conservation advice packages/biotope information for the local area.

23 The following response seeks to address both Natural England's request for information, and also the ExAQ2 (2.14.1 and 2.14.2) and relates only to Thanet Coast SAC and MCZ. Goodwin Sands pMCZ is considered in Section 1.6 in relation to the Goodwin Sands/Dover Harbour dredging.

24 The ongoing works at Ramsgate form part of the assessed baseline as these works were underway during the baseline characterisation survey. Notwithstanding this, the Physical Processes Technical Report (App ref 6.4.2.1; Section 3.4.1) confirms that given the very close proximity of the two activities, it is considered that both types of plume interaction could theoretically occur. However, it is noted that in line with UNCLOS, (The United Nations Convention on the Law of the Sea), cable installation vessels typically request a 1 nautical mile (circa 1.85 km) vessel safety zone when installing or handling cables. Accordingly, whilst plume interaction may still occur, the potential for much higher concentration and more persistent plumes than the project-alone assessments of SSC is considered to be small. This assessment did not consider the cable exclusion zone which inherently increases the likely distance between plumes, and therefore reduces this effect further.

25 Cumulative increases in bed level could also occur. However, it is noted that this location has been chosen for the disposal of dispersive dredged material and therefore disposed material is expected to be regularly re-worked. It is anticipated that in the long-term material will be transported away from the area in a north-easterly direction (Cefas, 2001).

26 Beyond this context and understanding in general and project specific terms, it is acknowledged that Ramsgate Harbour have an existing Marine Licence for maintenance dredging within Ramsgate Port and Harbour (MLA/2015/00144/1). The licence runs from March 2016 for a period of ten years, allowing up to 125,000 tonnes per year of silt and up to 12,000 tonnes per year of sand. The silt to be deposited at TH140 Pegwell Bay, TH146 Ramsgate Harbour Site A and DV010 Dover, with the sand having a beneficial use on the Ramsgate Sands foreshore. The licence states '*The Port of Ramsgate has been dredged in this way for over 30 years with no environmental concerns'.*

27 The licence includes conditions (maximum tonnage at particular disposal sites) to minimise the risk for the Thanet Coast MCZ. The Benthic Ecology chapter of the Environmental Statement (APP-046) in Table 5.17 found the following as regards cumulative effects from suspended sediment and deposition *'The use of the Pegwell Bay and Ramsgate Harbour disposal sites is primarily for the dumping of sediment removed during maintenance dredging. The use of these sites is intermittent, and the volumes used are unknown in advance and therefore it is not possible to determine if the use of the sites will overlap with impacts from the construction of Thanet Extension. However, the while the volumes are likely to be greater, the impacts are likely to be similar to those for the deposition of the drilling arisings predicted for Thanet Extension.'*

28 Followed by paragraph 5.13.20 '*However, as the disposal events are discrete and the disposal areas are wide, it is considered unlikely that the increases in SSC and sediment deposition resulting from the use of the disposal sites combined with the other identified projects will cumulatively exceed the natural variation or the 5 cm smothering baseline to be considered 'light' smothering for the sensitivity assessments*'.

29 The RIAA (REP2-020) considered the potential for suspended sediment and deposition to affect the Thanet Coast SAC alone in paragraph 11.2.42 inter alia. No in-combination risk was identified during the drafting of the RIAA or highlighted during consultation. However, for the project alone the conclusion found in paragraph 11.2.44 *'the short-term and temporary nature of the change, the existing levels of SSC in the area, the ES conclusion of minor significance and the known low sensitivity of the chalk reef feature to siltation, it is concluded that the sites conservation objectives will be maintained in the long-term*'. This was followed by a conclusion of no adverse effect on integrity.

30 Given the conclusion for the project alone with respect to suspended sediment and deposition on chalk reefs in the Thanet Coast SAC, the assessment in the ES in-combination with respect to benthic ecology from suspended sediment and deposition, together with the ongoing and longstanding maintenance dredging and disposal activity which is acknowledged to not represent an environmental concern, even if LSE were found to apply it would not be sufficient to result in an adverse effect. The Applicant has therefore assessed the potential in-combination effects with the Ramsgate harbour maintenance dredge activities and concluded that there would not be a significant effect on the conservation objectives of Thanet Coast MCZ (PINS Ref REP4-024; attached at Annex B of this appendix for completeness).

31 The Applicant further notes that the use of these sites is intermittent, with recent peaks reflecting political uncertainty associated with the potential use of Ramsgate as a ferry port in relation to Brexit emergency measures, and the exact volumes used are unknown in advance.

32 In conclusion therefore, what is known is that the Ramsgate works are a temporally discrete, ongoing activity which predates the baseline surveys undertaken for Thanet Extension and is therefore considered as part of the overall baseline of the receiving environment. Notwithstanding this the Applicant has undertaken reasonable assessments on this basis and can conclude that there will be no adverse effect on the Thanet Coast SAC and Thanet Coast MCZ either alone or in-combination with the works at Ramsgate Harbour.

Any change post Deadline 5:

33 In line with the second Examining Authority's questions (2.14.1), requesting further intelligence on Ramsgate Harbour Maintenance dredging the Applicant has reviewed available intelligence and can provide the following update. From 7 March to 9 April 2019, Thanet District Council sought expressions of interest in support of its plans to repair/renew a berth consisting of two barges. The Feasibility Study is expected December 2019. The works are not described as an upgrade, but are a renewal and repair of existing facility. Similar refurbishment works were undertaken to Berths 2 and 3 in 2016, in anticipation of a new cross channel ferry operation at the port (being the recent failed bid, see below under the Applicants response to 2.14.2). It is not anticipated that the works (with no information yet available, pending tender of the Scoping study) will require a capital dredge, as these are not new works and therefore no potential for a cumulative or in-combination effect with Thanet Extension.

34 Furthermore, and directly in response to ExQ2-2.14.2 No plans for capital dredging were available as a licence application (as listed on the MMO Public Register), with considerable speculation in the Press (re the Seaborne Freight proposals). All dredging information available related to maintenance dredging, as addressed in the Applicants response to 2.14.1 above.

35 As noted previously it is understood that the bid to return commercial ferries to Ramsgate Harbour (the Seabourne Freight proposals) has failed due to a lack of vessels and experience in running commercial vessel operations. Current position is therefore that no capital dredge is expected to be required, as the relevant planned works are no longer being brought forward. Therefore, there is no possibility of a cumulative and/or in-combination effect.

1.5 Request for tabulated summary and illustration of maximum design scenario

The information on designated features as receptors should be presented in the RIAA/MCZ assessment, as currently we are being directed to multiple documents in order to understand the assumptions of the worst case scenario presented, and the outcome for the receptors. We believe this could be succinctly presented in a table or a few lines of additional text? A map of the WCS in terms of deposition and the resulting sedimentation / plume would be a really good visual aid if possible too.

36 Table 1 above presents this information in the requested format, with Figure 1 illustrating this as requested. For completeness the most recent iteration of the MCZ clarification note (Appendix 20 to Deadline 4) and the MCZ assessment report (Application ref 6.4.5.3) are annexed to this deadline 5 submission at Annex B and C.

2. Additionally, we advise that extraction within the [p]MCZ should be assessed as a pressure. By removing material during sandwave clearance the applicant is still creating the extraction action / pressure irrespective of whether the sediments are redeposited within the pMCZ. There is also still no firm commitment to retain sediments within the pMCZ.

37 Whilst the Applicant notes Natural England's position on this, it is clear from the Advice on Operations for Thanet Coast MCZ (noting Natural England have advised to use this source for both Thanet Coast MCZ and Goodwin Sands pMCZ in the absence of published Advice on Operations for Goodwin Sands pMCZ) that the installation of cables Activity (***Power cable: laying, burial and protection***) includes consideration of pre-sweep dredging. Specifically, the Advice on Operations notes the following for what are considered to be the most relevant Activity Pressures:

- ***Abrasion/disturbance of the substrate on the surface of the seabed***

o *Depending on the installation method used, the footprint of the cable installation machinery could be up to 20 m wide where pre-sweep dredging is required, or between 5-10m wide per cable trench for ploughing, and trenching (Aecom Intertek., 2011),(Nemo Link, 2013).*

- ***Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion***

o *Direct penetration and disturbance of habitat will occur as a result of ploughing, trenching, rock placement, anchor placement and ground preparation dredging if required. Depending on the installation method used, the footprint of the seabed disturbed by the cable installation machinery could be up to 20 m wide where pre-sweep dredging is required, or between 5-10m wide per cable trench for ploughing and trenching.*

- ***Smothering and siltation rate changes (Heavy)***

- During cable installation and when ground preparation pre-sweep dredging is conducted, dredged sediments can be disposed of within the limits of the activity licence area resulting in high siltation rate changes (Normandeau Associates et al., 2011

38 In this context it is considered not appropriate to apply an aggregate extraction pressure to pre-sweep dredging/sandwave clearance. The Applicant notes Natural England's observation regarding a firm commitment to retain sediments within the pMCZ. Whilst the Applicant has noted previously that the physical processes 'system' of relevance to Goodwin Sands operates at a far greater scale than the pMCZ, and as such sediment retained within the disposal site will essentially remain within the system of relevance, the Applicant has committed to retaining the sediment as close as is practicable to the pMCZ. This commitment is in the most recent revision to the Schedule of Mitigation submitted at Deadline 5.

39 The worst case assessment assumed jetting, as this would mobilise the greatest volume of sediment. As noted in the Advice on Operations pre-sweep dredging will act in a similar way to proposed jetting with the assessment assuming activities will only locally displace the disturbed sediment volume, which will remain the same sediment type as the surrounding seabed. For cable installation and sandwave clearance it was concluded that no sediment volume will be removed from the sedimentary system. Specifically, with regards Goodwin Sands it was concluded (App ref 6.2.2; para 2.10.50) that the patterns of processes governing the overall evolution of the systems (the flow regime, water depths and sediment availability) are at a much larger scale than, and so would not be affected by, the proposed local works. As a result, the proposed levelling is not likely to influence the overall form and function of the system and eventual recovery via natural processes is therefore expected.

1.6 In-combination effects (Dover Harbour Dredging)

As above in section 1, more detail on the impacts to the Goodwin Sands pMCZ features in terms of the variables listed above would be welcome. In terms of in combination with the DHB aggregates site, the (percentage) area of to be impacted by the applicants cabling works should be presented alongside the (percentage) area of the aggregates area to successfully compare the impact. This will probably show that there are still vast areas of unimpacted sand to ensure recovery of both activities, even if they are both in an impacted state at the same time. However, we need that confirmation.

40 The overall area of interaction from the project alone is presented in **Error! Reference source not found.** above and has been identified in Appendix 20 of the deadline 4 submission as 1.13km^2. The area of total effect associated with DHB aggregates is 3.9km^2 (DHB ES). As noted in Appendix 20 of the Deadline 4 submission the offshore export cable corridor overlaps with the north-western corner of the pMCZ, an area of approximately 1.13 km^2. Although there is an area of overlap, it should be noted that this is small in the context of the rest of the Goodwin Sands site (approximately 0.4% of the total 265.92 km^2). The combined effect of disturbance is therefore 5km^2 which translates as 1.89% of the 265.92km^2 Goodwin Sands and gravels feature.

41 As further noted the works from Thanet Extension represent a much smaller extent within the pMCZ than those from the DHB dredging scheme, and therefore any construction phase impacts (i.e. temporary habitat loss and temporary increases to SSC and deposition) from Thanet Extension make a comparatively smaller contribution to any cumulative impacts to the site. As described in paragraph 26, bullet point 2 of Appendix 20 to the Deadline 4 submission document, full recovery is expected within months to up to 2-3 years (noting this is a conservative assessment).

Furthermore, the recover/maintain General Management Approach (GMA) should be taken from the DEFRA consultation for the site – and the Thanet Coast MCZ package used for the ecological principles. In real terms this just means that the rock feature should have a recovery objective. However, we don't foresee that feature being impacted by your development from what we can see – so a relatively minor comment.

42 The Applicant notes this response and can confirm that the rock features of both the SAC and MCZ are avoided by direct impacts, and any secondary impacts associated with deposition will be short term and temporary in nature and as such will not hamper the objective of the rock feature to recover.

1.7 Conclusion

43 In conclusion it is the Applicant's evidenced position that there will be no adverse effect on integrity on the Thanet Coast SAC either from Thanet Extension cable works alone or in-combination with other projects.

44 It is also the Applicant's evidenced position that there will be no hindrance to either Thanet Coast MCZ or Goodwin sands pMCZ conservation objectives from either the Thanet Extension cable works alone, or in-combination with other projects.

45 These conclusions apply both to the potential effects from suspended sediment and deposition associated with the Thanet Extension project cable installation, or the wider cable design envelope including sand wave clearance and cable protection.

46 The Applicant has however committed to undertake monitoring of the relevant area of the Goodwin Sands pMCZ in the event that either cable protection or sandwave clearance are required within the Goodwin Sands pMCZ.

Vattenfall Wind Power Ltd

Thanet Extension Offshore Wind Farm

Annex A to Appendix 32 to Deadline 5 Submission: Physical Processes technical clarification note

Relevant Examination Deadline: 5

Submitted by Vattenfall Wind Power Ltd

Date: April 2019

Revision A

Drafted By:	ABPmer
Approved By:	Daniel Bates
Date of Approval:	April 2019
Revision:	A

Revision A	Original document submitted to the Examining Authority

Background

ABPmer has written both the Environmental Statement Chapter and the associated Technical Report, for the Marine Geology, Oceanography and Physical Processes topic, for the proposed Thanet Offshore Wind Farm (TEOW):

- Thanet Offshore Wind Farm Environmental Statement, Volume 2, Chapter 2, Marine Geology, Oceanography and Physical Processes. June 2018. Revision A. Document Reference 6.2.2.
- Thanet Offshore Wind Farm Environmental Statement, Volume 2, Annex 2-1: Marine Geology, Oceanography, Physical Processes Technical Report. June 2018. Revision A. Document Reference 6.4.2.1.

Together, the above reports provide a complete description of:

- The relevant baseline environmental conditions;
- The full range of potential impact types identified and scoped in for assessment;
- The realistic worst case design envelope considered;
- The nature of the potential impacts;
- The impact assessment methodology;
- The likely magnitude, extent, duration, recoverability and other relevant descriptors for the potential impacts that may arise.
- An assessment of significance for these impacts where a sensitive (physical processes) receptor is identified.
- The significance of physical processes impacts to other receptor types (e.g. benthic ecology) is assessed in the other corresponding sections of the Environmental Statement.

Only selected technical details are repeated in this note. Readers should refer to the Environmental Statement Chapter and the associated Technical Report for more details if needed.

This note provides a visualisation of selected tabulated results already presented in the Environmental Statement Chapter and the associated Technical Report.

This information is provided to inform the further consideration of certain potential impacts due to sediment plumes and sediment deposition, in designated areas adjacent to the export cable corridor, as requested by Natural England during the project examination.

Visualisation of Selected Potential Impacts

The potential impacts addressed in this note are the extent of plumes of relatively elevated suspended sediment concentration, and the extent of subsequent sediment deposition that might cause smothering to benthic ecology habitats or receptors, caused by sediment disturbance during export cable burial by jetting and associated sandwave levelling by dredging.

The assessments in sections 3.3.4 and 3.3.5 of the Technical Report provide quantitative estimates of the range of realistically likely extent, duration and concentration of sediment plumes and the extent/dimension and thickness of sediment deposits that might result from local deposition of the limited volumes of sediment being disturbed. See the report for more details.

For sediment plumes, the rate of sediment disturbance, the sediment settling rate and the water depth are used to estimate the amount of sediment in suspension, the time spent in suspension, and the distance over which the sediment might be advected before deposition.

For sediment deposition, as the volume of sediment is limited (by the dimensions of the trench or the capacity of the dredger), the maximum average thickness of deposition is calculated directly for a range of realistically possible deposition extents/areas following sudden release of the full dredger hopper load at the chosen spoil disposal location (which would be within the red line boundary and nearby to the sandwave clearance activities).

The impact of a sediment deposition thickness of 0.3m has been assessed in relation to sensitive receptors for other topics, elsewhere in the Environmental Statement. A smaller thickness of 0.05m is also used in some cases. These thickness values present a joint worst case scenario for the extent and thickness of smothering effects. Greater deposition thicknesses could realistically occur, but would be associated with a smaller extent of effect. Smaller deposition thicknesses could also realistically occur (over a larger area) but the identified receptors might not be sensitive to the effect.

It is noted that local displacement of relatively small volumes of sediment by jetting or dredging is not likely to measurably change the type or texture of sediments in the affected seabed surface areas. Once redeposited, the displaced sediment will immediately re-join the natural sedimentary environment and will be subject to and available for onward transport at the natural ambient rate and direction.

Export cable burial by jetting

For export cable burial by jetting:

- The design envelope is outlined in Table 19;
- The distance that sediment might be advected downstream by the ambient currents before settling back to the seabed depends on the ambient current speed and the time spent in suspension. The time spent in suspension depends on the settling rate and the height of initial disturbance above the seabed. Coarser sediments will settle back to the seabed at a rate proportional to their diameter (gravel settles faster than sand). The ambient current speed (and direction) can vary widely over time within the naturally occurring range and with distance along the route.
- Results for a range of realistically possible downstream distances of dispersion are provided in Tables 20 and 21, for gravel and sand, which could be less or more widely dispersed, respectively. The following is an outline summary of this range of results.
- Gravel will likely remain in suspension for only a matter of seconds to tens of seconds and so will not be advected more than a few meters to a few tens of meters from the working site;
- Sand will likely remain in suspension for tens to a few hundreds of seconds and so may be advected tens of meters to a few hundreds of meters from the working site;
- Finer sediments that persist in suspension for longer periods of time may be transported downstream up to a maximum distance of one tidal excursion before the tide reverses.
- The disturbed volume of sediment (7.5m^3/m of trench) could accumulate to a maximum average thickness of 0.3m if the whole deposit is evenly spread over a distance up to 25m from the cable trench;
- The disturbed volume of sediment (7.5m^3/m of trench) could accumulate to a maximum average thickness of 0.05m if the whole deposit is evenly spread over a distance up to 150m from the cable trench.

The export cable might be installed anywhere within the cable corridor, which is approximately 1km wide or more along most of its length.

Figure 1 shows the position of a 25m and 150m buffer outside of the cable corridor boundary, which indicate the maximum distances outside of the red line boundary to which gravel or sand plumes, and/or sediment deposition thicknesses of 0.05 to 0.3m might realistically occur, if the cable is

installed at the very edge of the cable corridor, and assuming that the ambient currents are in that direction at the time of the work.

Figure 1 also shows the extent of the mean spring tidal excursion buffer around the whole of the cable corridor and array area. This is the maximum distance to which more persistent (finer) sediment plumes might be advected, although typically at low concentrations.

Local sandwave clearance by dredging

For local sandwave clearance by dredging:

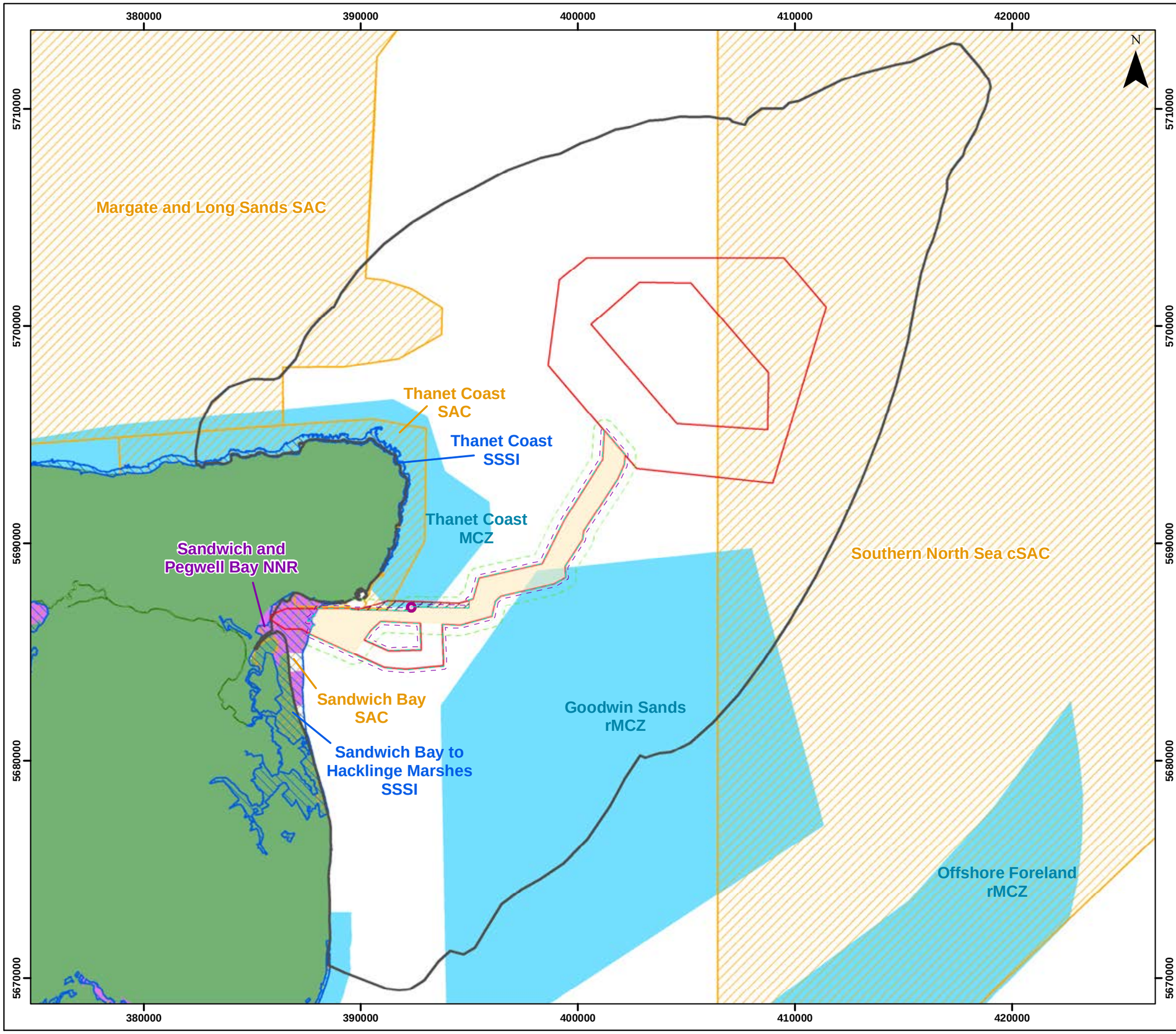
- The design envelope is outlined in Table 18;
- The dredger will accumulate dredged sediments in a hopper while working. The full volume of sediment (up to the full capacity of the hopper) will be released back to the seabed via the water column as a sudden release event. The majority (90%) of the material is assumed to descend rapidly and directly to the seabed under the vessel and will form a deposit of variable overall dimensions depending on the total volume and soil properties of the spoil, the local water depth, and the local topography of the seabed at the disposal location.
- Results for a representative dredger and a range of realistically possible dredging scenarios and spoil deposit shapes are provided in Tables 15 and 17. The following is an outline summary of this range of results.
- Sand released at the water surface at sufficiently low concentrations to form a plume will likely remain in suspension in the order of hundreds of seconds (depending on the local water depth) and in this time may be advected around 100 to 500 meters from the working site;
- Finer sediments that persist in suspension for longer periods of time may be transported downstream up to a maximum distance of one tidal excursion before the tide reverses.
- The main volume of spoil material (9,900m^3) could accumulate to a maximum average thickness of 0.3m if the whole deposit is evenly spread in a circular shape with diameter 204m;
- The main volume of spoil material (9,900m^3) could accumulate to a maximum average thickness of 0.05m if the whole deposit is evenly spread in a circular shape with diameter 502m.

Dredging might occur and dredge spoil might be disposed of anywhere within the cable corridor, which is approximately 1km wide or more along most of its length.

Figure 1 shows the position of a 150m buffer outside of the cable corridor boundary, and a 500m buffer outside of the dredge disposal area boundary, which can be used to judge the maximum distances (100 to 500m) outside of the dredge disposal area boundary to which sand plumes might realistically occur, if the dredging or spoil disposal occurs at the very edge of the cable corridor, and (in the case of plumes) assuming that the ambient currents are in that direction at the time of the work.

Figure 1 also shows the relative size of a 200m and a 500m diameter circular dredge spoil deposit, corresponding to maximum average thicknesses of 0.3m and 0.05m for a full hopper load. The centre of the example deposit is located on the edge of the dredge disposal area and close to a designated area. The shape thereby illustrates the maximum area of impact to the designated area if the spoil is deposited at the very edge of the dredge disposal area. The maximum distances that circular deposit shapes with these dimensions will extend outside of the dredge disposal area are half the diameter, 100m or 250m, respectively. The 150m buffer line therefore also provides a visual indication of the maximum extent of effect from such discrete deposits elsewhere on the edge of the dredge disposal area.

Figure 1 also shows the extent of the mean spring tidal excursion buffer around the whole of the cable corridor and array area. This is the maximum distance to which more persistent (finer) sediment plumes might be advected, although typically at low concentrations.



THANET EXTENSION OFFSHORE WIND FARM

Figure 1

Designated Sites and Selected Cable Corridor Buffer Distances

Legend

- Cable Corridor - 25 m Buffer
- Cable Corridor - 150 m Buffer
- Example Deposit - 200 m Diameter
- Example Deposit - 500 m Diameter
- TEOW Disposal Site 3
- Sandwave Clearance - 500 m Buffer (maximum distance for sand in suspension)
- Offshore Red Line Boundary
- Cable Exclusion Area
- Spring Tide Excursion Buffer

Designated Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Marine Conservation Zone (MCZ)
- National Nature Reserve (NNR)

Datum: ETRS 1989
Projection: UTM31N

1:175,000 0 1.5 3 km 0 1 2 nm

Drg No	005_Exam_Fig1_buffer		
Rev	0.1	Date	29/04/2019
By	PN	Layout	N/A

Figure 1

Vattenfall Wind Power Ltd

Thanet Extension Offshore Wind Farm

Annex B to Appendix 32 to Deadline 5 Submission: MCZ Assessment Clarification Note (as submitted to Deadline 4)

Relevant Examination Deadline: 5

Submitted by Vattenfall Wind Power Ltd

Date: April 2019

Revision B

Drafted By:	GoBe Consultants Ltd
Approved By:	Daniel Bates
Date of Approval:	April 2019
Revision:	B

Revision A	Original document submitted to the Examining Authority
Revision B	Revised document submitted to the Examining Authority

Vattenfall Wind Power Ltd

Thanet Extension Offshore Wind Farm

Appendix 20 to Deadline 4 Submission: MCZ Assessment Clarification Note

Relevant Examination Deadline: 4

Submitted by Vattenfall Wind Power Ltd

Date: March 2019

Revision B

Drafted By:	GoBe Consultants Ltd
Approved By:	Daniel Bates
Date of Approval:	March 2019
Revision:	B

Revision A	Original document submitted to the Examining Authority
Revision B	Revised document submitted to the Examining Authority
N/A	
N/A	

Contents

Figures

Tables

1 Goodwin Sands pMCZ Clarification Note

1.1 Context and Background

1 At the time of Application, the Goodwin Sands proposed MCZ (pMCZ) (then the Goodwin Sands recommended MCZ (rMCZ)) had not been taken forward for consultation for inclusion in the third tranche of MCZ designations. As such, there was no obligation for formal consideration of the site within an MCZ Assessment. In addition to this, the lack of certainty with regards to conservation objectives against which potential effects could be assessed made assessment impractical.

2 In response to Section 42 consultation on the PEIR, a proxy MCZ assessment was undertaken, with reference to assessments already undertaken in the Environmental Statement (ES), specifically Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (PINS Ref: APP-043/ Application Ref: 6.2.2) and Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (PINS Ref: APP-046/ Application Ref: 6.2.5). This proxy assessment was set out in Volume 4, Annex 5.3: MCZ Assessment of the ES (PINS Ref: APP-083/ Application Ref: 6.4.5.3).

3 Following submission of the application, the Goodwin Sands rMCZ was brought forward for consultation as a pMCZ. As the Goodwin Sands pMCZ is only proposed, rather than fully designated, there are no published conservation objectives for the site. Natural England have advised that the Thanet Coast MCZ package be used as a proxy for the Goodwin Sands. This includes conservation objectives, advice on operations and general management approach for those features shared between the two sites.

1.2 Applicant Response

4 In order to address the concerns raised by Natural England, the Applicant has prepared this clarification note. It identifies the sensitive features of the Goodwin Sands pMCZ according to the Natural England advice on operations, with an assessment of impacts to those features against the relevant conservation objectives of the Thanet Coast MCZ as a proxy, in the absence of published conservation objectives for the Goodwin Sands pMCZ.

5 This document provides a revised MCZ Assessment for the Goodwin Sands pMCZ following the advice of Natural England in its Written Representation. For context, it should be read alongside the original MCZ Assessment submitted as part of the Application (Volume 4, Annex 5-3: MCZ Assessment (PINS Ref: APP-083/ Application Ref: 6.4.5.3)).

6 At Deadline 3, the Applicant submitted (at the request of the ExA) a figure illustrating the geographical extents of the proposed Thanet Extension works within the Goodwin Sands pMCZ and the consented aggregate dredging within the pMCZ for the Dover Harbour Board Western Docks Revival project. The Applicant has also submitted a revised Sandwave Clearance, Dredging and Drill Arisings Disposal Site Characterisation (Appendix 15 to the Deadline 4 Submission) which details the disposal activities from the proposed development.

1.3 Revision for Deadline 4

7 The MCZ Clarification Note was submitted as Appendix 25 to the Deadline 2 submission. Natural England subsequently reviewed this document and provided comment on the submissions at Deadlines 1 and 2 in their Deadline 3 response (PINS Ref: REP3-020). This revised MCZ Clarification note seeks to address the concerns raised within Table 2 of Natural England's comments on clarification notes submitted at Deadlines 1 and 2 (PINS Ref: REP3-020). This is in addition to comments being addressed in the Appendix 3 to the Applicant's Deadline 4 response (Response to Other IPs). The comments raised by Natural England in relation to the MCZ Clarification Note are listed, alongside with how they have been addressed in this revised document, in Table 1 below.

Table 1: Natural England's comments on the MCZ Clarification Note submitted at Deadline 2 and how they have been addressed in this revised document.

Point	Section (of Rev A)	Comment	How it has been addressed
1	11	Considering the ephemeral nature of Sabellaria and the fact data was collected in 2014 for the MCZ characterisation data, by the time construction is due to take place this feature could have colonised this area. The biogenic reef plan and pre-construction surveys with the potential for ground truthing, if this feature is identified, would further the understanding of the cabling area. However, these ground truthed points for biogenic reef to be replicated post construction to determine any impacts.	The presence of *Sabellaria spinulosa* reefs will be informed by pre-construction surveys. These will be ground-truthed where potential reef is identified as described in the biogenic reef mitigation plan. Post-construction monitoring will be used to determine the effectiveness of any micro-siting required.

Point	Section (of Rev A)	Comment	How it has been addressed
2	17	Disposal events need to be more specific in relation to the MCZ.	A revised document 'Sandwave Clearance, Dredging and Drill Arisings: Disposal Site Characterisation' has been submitted as Appendix 15 to the Deadline 4 Submission. This provides detailed information as regards the sandwave clearance, dredging and disposal activities for Thanet Extension. Sediments within the pMCZ will be retained within the pMCZ as far as reasonably practicable.
3	Table 2	Although not highlighted as a "High-Medium" risk, the pressure "Habitat structure changes-removal of substratum (extraction)" is still highly relevant to the cable activities within the pMCZ especially if sandwave clearance is to take place. Querying the Advice on operations for the Thanet Coast MCZ all features related to Goodwins Sands pMCZ features are sensitive to this pressure.	As described in the Caption for Table 3, only 'high-medium risk' pressures have been included here. Any sediments 'removed' through sandwave clearance will be re-deposited and retained within the pMCZ as far as reasonably practicable.
4	22	Why does this paragraph relate to direct habitat loss instead of temporary habitat loss as highlighted within the title?	The terms 'direct habitat loss' and 'temporary habitat loss' have been used interchangeably here. For clarity, the document has been updated to ensure consistent use of terms.
5	31	This section should clearly state what the anticipated levels of smothering in the pMCZ on the relevant habitats are. There could be the potential for heavy smothering due to deposition from sandwave clearance.	Further clarification has been provided in paragraph 32.

Point	Section (of Rev A)	Comment	How it has been addressed
6	32	As highlighted above, dredged material should be deposited on material of the same sediment grain size to avoid loss of extent.	Sediments dredged within the pMCZ through sandwave clearance will be retained within the pMCZ as far as reasonably practicable. See also Appendix 15 of the Deadline 4 Submission.
7	33	If there is going to be long term habitat loss due to the presence of cable protection we require site specific information to assess the significance of this loss in the pMCZ. This also raises the need for sufficient cable burial to occur to avoid this loss in the first instance, which could be ensured by further site specific surveys at the pre-construction stage.	The Applicant notes that cable burial is the preferred method, and that cable protection would only be required where burial to a sufficient depth was not possible. The final position of cables will be decided in the pre-construction phase and will be informed by pre-construction surveys. See paragraph 36.
8	33	The assumption by the applicant is that 100 % of the cable within the pMCZ will require additional cable protection. Although we appreciate this is a conservative estimate, Natural England advise that due to the pressure of habitat modification / loss, the amount of rock protection should be kept to a minimum.	The Applicant notes that cable burial is the preferred method, and that cable protection would only be required where burial to a sufficient depth was not possible. The final position of cables will be decided in the pre-construction phase and will be informed by pre-construction surveys.
9	33	This percentage loss is not necessarily considered an insignificant amount and could have the potential to hinder the conservation objectives.	A typographic error incorrectly described the percentage loss as 0.25%. the correct percentage loss is 0.025% (now corrected in paragraph 34). It is noted that this is a conservative assumption and the use of cable protection is not a preferred option. Any cable protection is likely to become covered with a layer of surficial sediment as evidenced by monitoring at the existing Thanet Wind Farm and it is therefore considered that there is no

Point	Section (of Rev A)	Comment	How it has been addressed
			potential for this impact to hinder the conservation objectives of the site.
10	34	We request a copy of the Thanet OWF monitoring report with regard to the infilling of the rock protection.	Please see above response to NE comment 34
11	35	Natural England disagree with the overall conclusions as stated in this paragraph. Although the overall extent is relatively small, it still represents a loss of a feature for which the site is designated for. Therefore, it needs to be refined, as well as an assessment of the functional importance of the lost habitat, using attributes from Natural England's conservation advice.	The area of potential habitat loss as a result of the presence of cable protection represents 0.025% of the Goodwin Sands pMCZ as a conservative worst-case. In practice, cables will be buried where possible (subject to the CBRA) with additional protection not being the preferred option. In addition, monitoring from TOWF has shown cable protection becoming covered in surficial sediments such that there is no fundamental change in habitat type. It is therefore considered that the potential impacts from the project do not hinder the conservation objectives of the site.
12	40	With regards to bullet point 2, if the WCS of 100 % cable protection is utilised within the site, the extent of the feature will be affected and will not be stable.	As stated above, the area of potential habitat loss as a result of the presence of cable protection represents 0.025% of the total area of the Goodwin Sands pMCZ as a conservative worst-case. Reference to monitoring of the existing TOWF has shown that cable protection has become covered with a layer of surficial sediment and therefore there is no fundamental change in habitat.

1.4 Revised Goodwin Sands pMCZ Assessment

Introduction

8 This section describes the revised assessment of potential impacts to the Goodwin Sands pMCZ following the advice of Natural England to use the Conservation Objectives and Advice on Operations of the Thanet Coast MCZ (where applicable) in lieu of that for the pMCZ.

9 The Thanet Extension Offshore Export Cable Corridor (OECC) overlaps with the north-western corner of the Goodwin Sands pMCZ, covering an area of approximately 1.13 km^2 the Thanet Extension array boundary is approximately 3.08 km from the pMCZ at its closest point. Due to this area of overlap, there is the potential for a receptor-impact pathway that could result in effects on the habitats and features of conservation importance of the proposed site.

10 According to the Goodwin Sands pMCZ consultation factsheet (Defra, 2018), the site would protect:

- Subtidal sand;
- Subtidal coarse sediment;
- Blue mussel beds;
- English Channel outburst features;
- Moderate energy circalittoral rock; and
- Ross worm reefs (*Sabellaria spinulosa*).

11 The broadscale habitats 'subtidal sand' and 'subtidal coarse sediment' are the dominant features, covering 160 km^2 and 116 km^2 of the site, respectively, whilst 'moderate energy infralittoral rock' covers an area of approximately 1 km^2. The 'moderate energy circalittoral rock' features are approximately 8 km from the export cable corridor and 3.6 km from the array.

12 *Sabellaria* reefs and blue mussel beds cover much smaller areas, approximately 600 m^2 and 300 m^2, respectively. These features are not known to occur in the area of overlap between the cable corridor and the pMCZ, as evidenced by subtidal verification surveys (Figure 1) undertaken for the MCZ characterisation (presented in Defra, 2018).

13 The habitats present in the area of overlap have been identified by site-specific characterisation surveys for Thanet Extension (illustrated in Figure 2). Data from the 2014 Cefas pMCZ subtidal verification survey is also illustrated in Figure 3. These data show that the seabed habitats present in the area of overlap consist mainly of subtidal sand, with smaller areas of subtidal mixed sediments and subtidal coarse sediment.

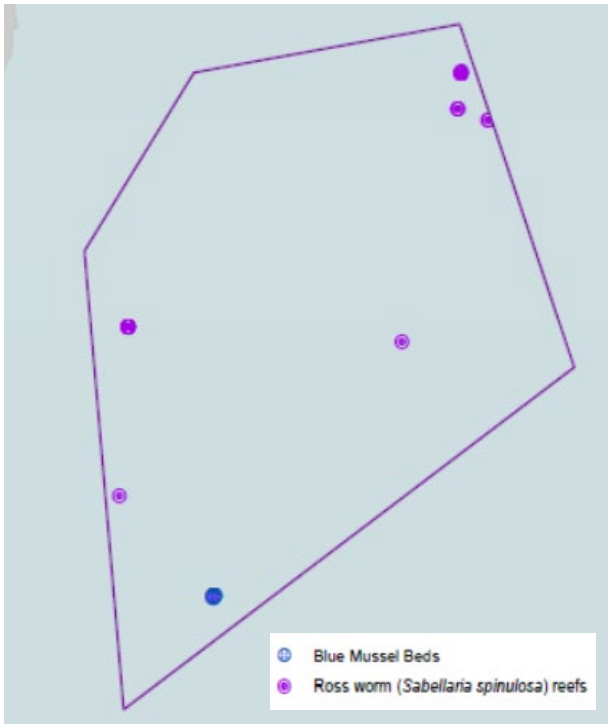


Figure 1: Locations of confirmed blue mussel beds and *Sabellaria spinulosa* reefs as identified by Cefas (2014) subtidal verification surveys.

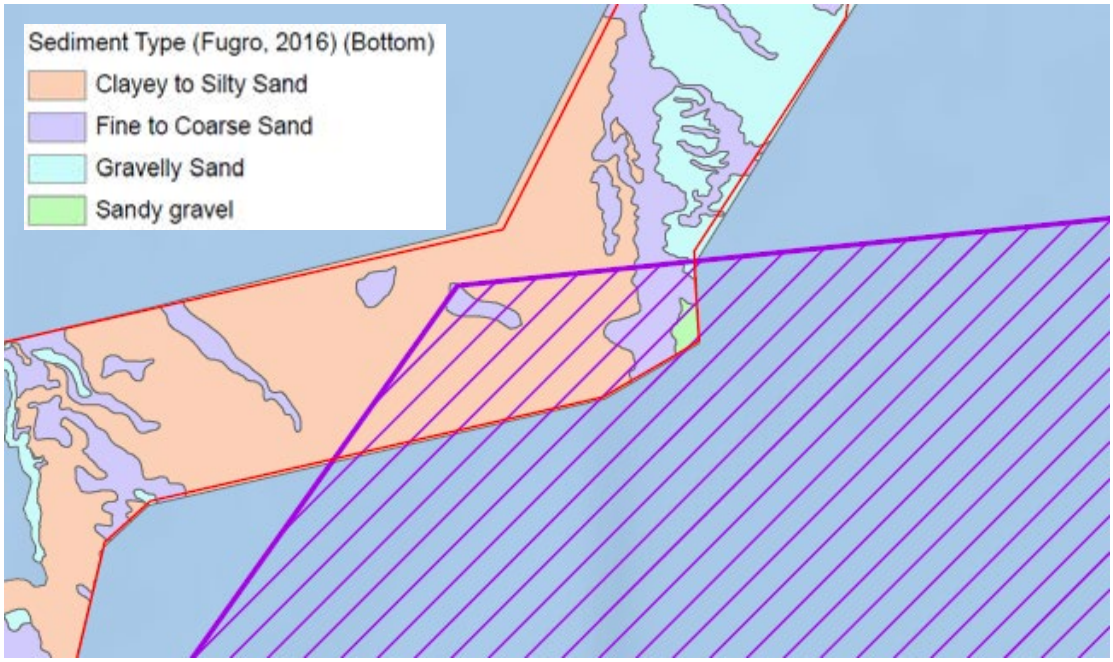


Figure 2: Seabed habitats/ sediment types in the area of overlap between the pMCZ and the export cable corridor as identified by the Fugro (2016) site-specific survey for the Thanet Extension baseline characterisation.

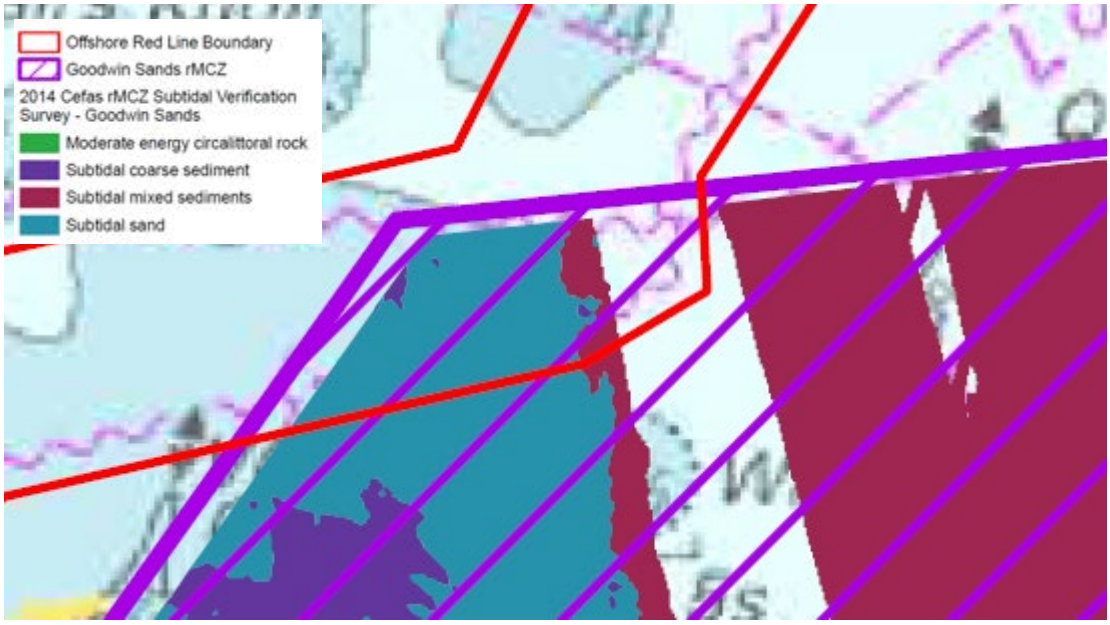


Figure 3 Seabed habitats present in the area of overlap between the Goodwin Sands pMCZ and the export cable corridor as defined by the Cefas (2014) rMCZ subtidal verification survey.

Screening of Potential Effects and Habitats/Features

14 A screening exercise to identify the potential impacts to MCZs was undertaken in Volume 4, Annex 5.3: MCZ Assessment (PINS Ref: APP-083/ Application Ref: 6.4.5.3), including for the Goodwin Sands pMCZ.

15 The habitats and features within the boundary of the Goodwin Sands pMCZ have the potential to be affected by Thanet Extension. The offshore export cable corridor overlaps with the north-western corner of the pMCZ, an area of approximately 1.13 km^3. Although there is an area of overlap, it should be noted that this is small in the context of the rest of the Goodwin Sands site (approximately 0.4% of the total 279.28 km^2). The overlap is also partial, and whilst cable installation could take place anywhere within the development boundary, it is possible that they may be installed further to the north, outside of the pMCZ altogether.

16 The impacts screened in for assessment in were:

- Construction:

- Temporary habitat loss/ disturbance due to cable installation activities in the Goodwin Sands pMCZ; and
- Temporary increases in SSC and associated deposition.

- O&M:
  - Long-term habitat loss due to the presence of cable protection in the Goodwin Sands pMCZ; and
  - Direct disturbance to the seabed from cable maintenance activities.

17 The conservation objectives of an MCZ establish whether a habitat or feature meets the required state (quality) and should be 'maintained' or falls below the required state and should be 'recovered to a favourable condition'. In lieu of published conservation objectives for the Goodwin Sands pMCZ, relevant conservation objectives for the Thanet Coast MCZ are described as a proxy in Table 2 against the habitats and features of Goodwin Sands.

18 Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes of the Environmental Statement (PINS Ref: APP-043/ Application Ref: 6.2.2) concluded that increases in SSC and associated deposition during cable installation (inclusive of sandwave clearance where required) would occur in close proximity to cable installation activity, with the majority of sediments settling within a few metres of the cable. Much of the seabed within the export cable corridor consists of coarse sediments and sands, including within the area of overlap with the Goodwin Sands pMCZ. As such, cable installation/sandwave clearance is not expected to create persistent plumes as the coarse material would settle quickly to the seabed. Furthermore, the low height of release of sediments from cable installation (up to a few metres above seabed level), the deposition of materials will be spatially limited up to approximately 20 m for gravels and a few hundred metres for sands. Finer material may be advected over greater distances, at which it would be near background concentrations.

19 As such, there is no potential for effects on either blue mussel bed or ross worm (*S. spinulosa*) reefs within the Goodwin Sands pMCZ and these features are screened out of the assessment. Furthermore, the Advice on Operations for the Thanet Coast MCZ provided by Natural England (Table 3) identifies that blue mussel beds are 'not sensitive' to changes in suspended solids, and *S. spinulosa* reefs are 'not sensitive' to changes in suspended solids or light smothering and siltation rate changes.

20 'Moderate energy circalittoral rock' features of the Goodwin Sands pMCZ are approximately 3.6 km from the array and 8 km from the export cable corridor. Therefore, for the same reasons outlined above, there is no potential for effects on these features and they are screened out of the MCZ assessment.

21 English Channel outburst flood features are not a part of the Thanet Coast SAC and are therefore cannot be compared in terms of conservation objectives or Advice on Operations. The English Channel outburst flood features consist of a deep channel in the eastern part of the site and are unlikely to be affected by cable installation activities. These features are therefore also screened out of the assessment.

22 The habitats and features screened in/out of the MCZ assessment are described in Table 2, along with the relevant conservation objectives from the Thanet Coast MCZ.

Table 2: Habitats and features of the Goodwin Sands pMCZ with relevant conservation objectives from the Thanet Coast MCZ as a proxy in the absence of published conservation objectives for the Goodwin Sands.

Habitats and features of the Goodwin Sands pMCZ	Relevant Conservation Objectives from the Thanet Coast MCZ	Screened into the Goodwin Sands pMCZ Assessment?
Subtidal Sand	Maintain in Favourable Condition	Yes
Subtidal Coarse Sediment		
Moderate Energy Circalittoral Rock		No
Blue Mussel Beds		
Ross Worm Reefs (*Sabellaria spinulosa*)	Recover to Favourable Condition	
English Channel Outburst Flood	N/A	N/A

Table 3: Advice on Operations provided by Natural England for the Thanet Coast MCZ. Natural England suggested in their Written Representation that these be used as a proxy for the Goodwin Sands pMCZ in the absence of Advice on Operations or Conservation Objectives for the site. Only pressures which are described as 'High-Medium Risk' have been included. S = Sensitive, NS = Not sensitive

Pressure	Habitat/ feature									
	Peat and clay exposures	Moderate energy infralittoral rock	Blue mussel beds	Subtidal chalk	Ross worm reefs	Subtidal coarse sediment	Subtidal mixed sediments	Subtidal sand	Moderate energy circalittoral rock	Stalked jellyfish (*Calvadosia cruxmelitensis*)
Power cable: laying, burial and protection										
Abrasion/disturbance of the substrate on the surface of the seabed	S	S	S	S	S	S	S	S	S	S
Changes in suspended solids (water clarity)	NS	S	NS	S	NS	NS	S	S	NS	S
Penetration and/ or disturbance of the substratum below the surface of the seabed, including abrasion	S	S	S	S	S	S	S	S	S	-

Pressure	Habitat/ feature									
	Peat and clay exposures	Moderate energy infralittoral rock	Blue mussel beds	Subtidal chalk	Ross worm reefs	Subtidal coarse sediment	Subtidal mixed sediments	Subtidal sand	Moderate energy circalittoral rock	Stalked jellyfish (*Calvadosia cruxmelitensis*)
Smothering and siltation rate changes (light)	S	S	S	S	NS	S	S	S	S	S
Power cable: operation and maintenance										
Abrasion/disturbance of the substrate on the surface of the seabed	S	S	S	S	S	S	S	S	S	S
Changes in suspended solids (water clarity)	NS	S	NS	S	NS	NS	S	S	NS	S
Penetration and/ or disturbance of the substratum below the surface of the seabed, including abrasion	S	S	S	S	S	S	S	S	S	-
Smothering and siltation rate changes (light)	S	S	S	S	NS	S	S	S	S	S

Stage One Assessment

Construction Phase – Temporary habitat loss/ disturbance due to cable installation activities

23 The worst-case scenario for temporary habitat loss and disturbance would be that four export cables are required to be installed by energetic means across the area of overlap between the Goodwin Sands pMCZ and the cable corridor, with each cable covering a highly conservative distance of 2.5 km. Assuming a maximum trench width of 10 m, this would result in a maximum area of direct disturbance of 0.1 km^2, representing 0.036% of the total area of the Goodwin Sands rMCZ, although the actual area affected is likely to be significantly lower.

24 The principle habitats in the area of overlap and therefore likely to be affected are 'subtidal sand' and 'subtidal coarse sediment', which are also present in the Thanet Coast MCZ. These habitats were identified according to the MarESA criteria as having high or medium recoverability to direct disturbance. It was assessed in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (PINS Ref: APP-046/ Application Ref: 6.2.5) that impacts from direct disturbance within the subtidal zone would be of minor adverse significance.

25 This is also reflected in the Advice on Operations which identifies the features of relevance (i.e. the subtidal coarse sediments within the pMCZ) in relation to the assessment of temporary habitat loss/ disturbance is equivalent to the pressure identified for cable laying, burial and protection of 'abrasion/ disturbance of the substrate on the surface of the seabed'. The Advice on Operations identifies that the relevant features have a range of sensitivities from low to medium at the pressure benchmark (physical damage to the habitat). Given the discrete, temporary and reversible nature of the effect, and the information drawn from the MarESA resources, overall sensitivity is concluded as low.

26 With respect to the proxy conservation objectives outlined in Table 2, it can be concluded that there is no significant risk of temporary habitat loss or disturbance due to cable installation activities hindering the conservation objectives of the Goodwin Sands pMCZ as:

- Temporary habitat loss/ disturbance is expected to affect a relatively small proportion of the proposed designated habitats of the MCZ during construction, with effects predicted to be short-term and reversible within the extent of the proposed designated features; and

- The structure and function, quality and composition of characteristic biological communities will remain in a favourable condition and will not deteriorate. Recovery of the lost/ disturbed habitats is expected within a few months to 2-3 years of cable installation, though this is considered conservative.

Construction Phase – Temporary localised increases in SSC and associated sediment deposition

27 Increases in SSC and associated deposition are predicted to occur as a result of construction activities, seabed preparation and cable installation. Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (PINS Ref: APP-043/ Application Ref: 6.2.2) provides a full description of the physical assessment, including a specific assessment with respect to increases in SSC and subsequent sediment deposition. The installation scenario that represents the worst-case for increases in SSC and associated sediment deposition is the use of energetic means of cable installation (such as jetting or mass-flow excavation, or dredging for sandwave clearance), which is assumed to result in up to 50% of material is actually ejected from the trench; the rest is retained as sediment cover within the trench. As well as the drilling of up to 50% of all foundations with drill arisings being deposited at the sea surface.

28 Effects from increased SSC and sediment deposition are expected to occur in close proximity to the construction activity, with the majority of disturbed material expected to settle quickly within a few metres. It is expected that any increases in SSC would be within the natural variation beyond a few metres. Finer material may be advected over greater distances, but it is not expected to settle to a measurable thickness beyond a few metres.

29 The principle habitats in the area of overlap and therefore likely to be affected are ‘subtidal sand’ and ‘subtidal coarse sediment’, which are also present in the Thanet Coast MCZ.

30 The impact of increases in SSC and associated sediment deposition is predicted to be of local spatial extent, short-term and intermittent in duration, and reversible following the cessation of activities. the habitats present were assessed in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (PINS Ref: APP-046/ Application Ref: 6.2.5) as having high recoverability to changes in SSC and deposition. The habitats in the region are accustomed to high levels of SSC that occur naturally and consequently have some tolerance to these effects. Effects from SSC and associated deposition were assessed as being of minor adverse significance.

31 This is also reflected in the proxy Advice on Operations for the Thanet Coast MCZ, which identifies that the features of relevance have a range of sensitivities from not sensitive to low in relation to the pressure 'changes in suspended solids (water clarity)'. The Advice on Operations bases this sensitivity on the pressure benchmark 'a change in one Water Framework Directive (WFD) ecological status class for one year within site'. Given that the cables will be installed in less than one year, and that cable installation will be a series of discrete operations rather than continuous, it can be concluded that the sensitivities of features in the MCZ will be low.

32 The Advice on Operations also provides information on the sensitivities of relevant features in relation to the pressure of 'smothering and siltation rate changes (light)'. The Advice on Operations identified a range of sensitivities from not sensitive to medium, and not sensitive to high for subtidal mixed sediments, based on the pressure benchmark of ''light' deposition of up to 5 cm fine material added to the habitat in a single discrete event'. In the ES, it was predicted that sediment displaced from export cable installation could spread to a thickness of 5 cm up to 500 m from the activity, assuming a uniform spread of sediment. However, in practice, the vast majority of this sediment will be re-deposited within the footprint, or immediately adjacent to, the activity. Fine material is not expected to be deposited at a measurable thickness further than a few metres away from the cable and the impact will therefore be highly localised. As such, due to the limited spatial extent of the cable installation operations, it can be concluded that these features are of medium sensitivity.

33 With respect to the proxy conservation objectives outlined in Table 2, it can be concluded that there is no significant risk of temporary habitat loss or disturbance due to cable installation activities hindering the conservation objectives of the Goodwin Sands pMCZ as:

- The extent of the designated features will not be affected by increases in SSC and associated sediment deposition, remaining stable following the construction phase; and
- The structure and function, quality and composition of characteristic biological communities will remain in a stable condition and will not deteriorate.

O&M Phase – Long-term habitat loss/ change due to the presence of cable protection

34 Long-term habitat loss may occur within the Goodwin Sands pMCZ during the O&M phase where cable protection is required for sections of the offshore export cables. Export cables are expected to be buried for the majority of the export cable route, only requiring additional cable protection where burial to target depth is not achievable. It has been assumed that 25% of the cable route may require additional cable protection. Based on the conservative assumption that 100% of the cable route that passes through the area of overlap (2.5 km) will require additional cable protection on the maximum four cables, and assuming a maximum cable protection width of 7 m, this would result in the loss of ~0.07 km^2 of seabed within the pMCZ, equivalent to 0.025% of the total area of the site.

35 Whilst the impact will result in a permanent change to seabed habitat, the area affected will be highly localised. Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (PINS Ref: APP-046/ Application Ref: 6.2.5) assessed all biotopes as having sensitivity to habitat loss/ change to a different seabed type as this is, in effect, a complete loss of the existing habitat and consequently there can be no recovery, although species may remain or re-colonise the area. Given that the sedimentary habitats are widespread throughout the pMCZ, and that the pMCZ already contains hard substrate outcrops (moderate energy circalittoral rock), the introduction of a relatively limited are of new hard substrate will not represent a significant change from the baseline environment within the site. It is also important to note that the existing seabed sediment transport, as detailed within the marine physical processes chapter (PINS Ref: APP-043/ Application Ref 6.2.2) at paragraph 2.11.36, is anticipated to infill the interstitial spaces within the rock material within a period of a few weeks to months, this is also evidenced by the existing Thanet OWF monitoring results. The surficial sediments are therefore expected to revert to baseline conditions and not result in a significant net loss of surface sediments. The significance of the effects of long-term habitat loss was assessed as being of minor adverse significance.

36 The requirement for cable protection will be informed by a Cable Burial Risk Assessment and pre-construction surveys. It is noted that burial is the preferred option and additional cable protection would only be required where burial to a sufficient depth is not achievable. Based on monitoring undertaken for the existing Thanet Offshore Wind Farm it is expected that any cable protection required will become covered with a layer of surficial sediments and therefore there will be no fundamental long-term change to the habitat type.

37 With respect to the proxy conservation objectives outlined in Table 2, it can be concluded that there is no significant risk of temporary habitat loss or disturbance due to cable installation activities hindering the conservation objectives of the Goodwin Sands pMCZ as:

- The extent of the designated features affected are small in the context of the overall available habitat in the rest of the pMCZ, even when considering the highly conservative assumptions above; and
- The change in seabed type does not represent a fundamental shift in terms of the other habitats in the pMCZ, or indeed the predicted infilling of the interstitial spaces of the cable protection, and therefore the structure and function, quality and composition of characteristic biological communities will remain in a stable condition and will not deteriorate.

O&M Phase – Direct disturbance to the seabed from cable maintenance activities

38 Direct disturbance and temporary habitat loss within the Goodwin Sands pMCZ may occur as a result of export cable maintenance activities, although the extent of this will be small relative to the entire pMCZ. The impacts would be of temporary, short-term duration and intermittent, and would be similar to those described above for 'Construction Phase – Temporary habitat loss/ disturbance due to cable installation activities'. It should be noted that beyond survey and monitoring, cable maintenance is not anticipated as a regular occurrence during O&M.

39 The habitats and species directly affected by temporary habitat loss/ disturbance have a low sensitivity to disturbance of this nature, and the significance of this effect, as predicted in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (PINS Ref: APP-046/ Application Ref: 6.2.5) is considered to be minor adverse.

40 The proxy Advice on Operations for the Thanet Coast MCZ identify that the relevant features have a range of sensitivities to 'abrasion/ disturbance of the substrate on the surface of the seabed' as identified for the construction phase impact above. Given the discrete, temporary and reversible nature of the effect, and the information drawn from the MarESA resources, overall sensitivity is concluded as low.

41 The habitats directly affected by temporary habitat loss/ disturbance have low sensitivity to disturbance of this nature, and therefore the significance of this effect is predicted to be minor adverse.

42 With respect to the proxy conservation objectives of the Thanet Coast MCZ as outlined in Table 2, it can be concluded that there is no significant risk from direct disturbance to the seabed from cable maintenance activities as:

- The extent of the proposed designated features will not be affected by the temporary disturbance, remaining stable during the O&M phase; and
- The structure and function, quality and composition of the characteristic biological communities will remain in a stable condition and will not deteriorate.

Decommissioning Phase

43 Potential impacts from decommissioning are expected to be no greater than those listed for construction, if project infrastructure is removed from the seabed at the end of the proposed development's operational life.

44 If it is deemed closer to the time of decommissioning that removal of certain parts of the proposed development would have a greater environmental impact than leaving *in situ*, it may be preferable to leave those parts *in situ*. In this case, the impacts would be no greater than those predicted for the O&M phase.

45 To date, no large offshore wind farm has been decommissioned in UK waters. It is anticipated that any future programme of decommissioning would be developed in close consultation with the relevant statutory marine and nature conservation bodies. This would enable the guidance and best practice at the time to be applied to minimise any potential impacts.

1.5 Potential cumulative impacts with maintenance dredging at Ramsgate Harbour

46 The Applicant notes that Natural England have also requested that the ongoing maintenance dredging works (fluidisation rather than use of the disposal site) at Ramsgate Harbour are also included within this clarification note. It is noted that this activity only occurs within the Harbour itself, and in line with the Harbour Authority's permit to undertake clearance works. As such there is limited information available, i.e. it is not a licensable activity for which information is available in the Marine Case Management System. What is known is that it is a temporally discrete, ongoing activity which predates the baseline surveys undertaken for Thanet Extension. Equally the proposed cable installation works, which will occur outwith the cable exclusion zone, are temporally and spatially discrete in a receiving environment which is characterised by coarse sands and sediments rather than the silts understood to form the basis of the Ramsgate Harbour maintenance works (Discussion held with Thanet Fishermen's Association, January 2019).

47 Any interaction will therefore be temporally limited and will occur against the baseline of the works already occurring and being considered as part of the project baseline characterisation. As such it is the Applicant's position that no further assessment of in-combination effects is necessary, with any likely interaction being temporally discrete and not significant in EIA terms, and therefore not likely to have a significant effect on the conservation objectives of the Thanet Coast MCZ.

1.6 Potential cumulative effects with aggregate dredging within the pMCZ for the Western Docks Revival project by Dover Harbour Board

48 At ISH3 it was requested that the Applicant provide a plan showing the geographical separation between the proposed activities associated with Thanet Extension and those associated with aggregate dredging for the Dover Harbour Board Western Docks Revival project.

49 Dredging for the DHB project is anticipated to be completed in two separate campaigns between September 2019 and September 2020, prior to the start of offshore works for Thanet Extension in Q1 2021. As well as being temporally isolated events, the two activities are geographically separated by approximately 10 km within the pMCZ. For ease of reference, this plan is shown below in Figure 4.

50 It is noted that spatially, the works from Thanet Extension represent a much smaller extent within the pMCZ than those from the DHB dredging scheme, and therefore any construction phase impacts (i.e. temporary habitat loss and temporary increases to SSC and deposition) from Thanet Extension make a comparatively smaller contribution to any cumulative impacts to the site. As described in paragraph 26, bullet point 2 of this document, full recovery is expected within months to up to 2-3 years (noting this is a conservative assessment). Considering the lack of temporal and spatial overlap of activities within the pMCZ, it is highly likely that cumulative recovery of communities would also fall within this timescale.

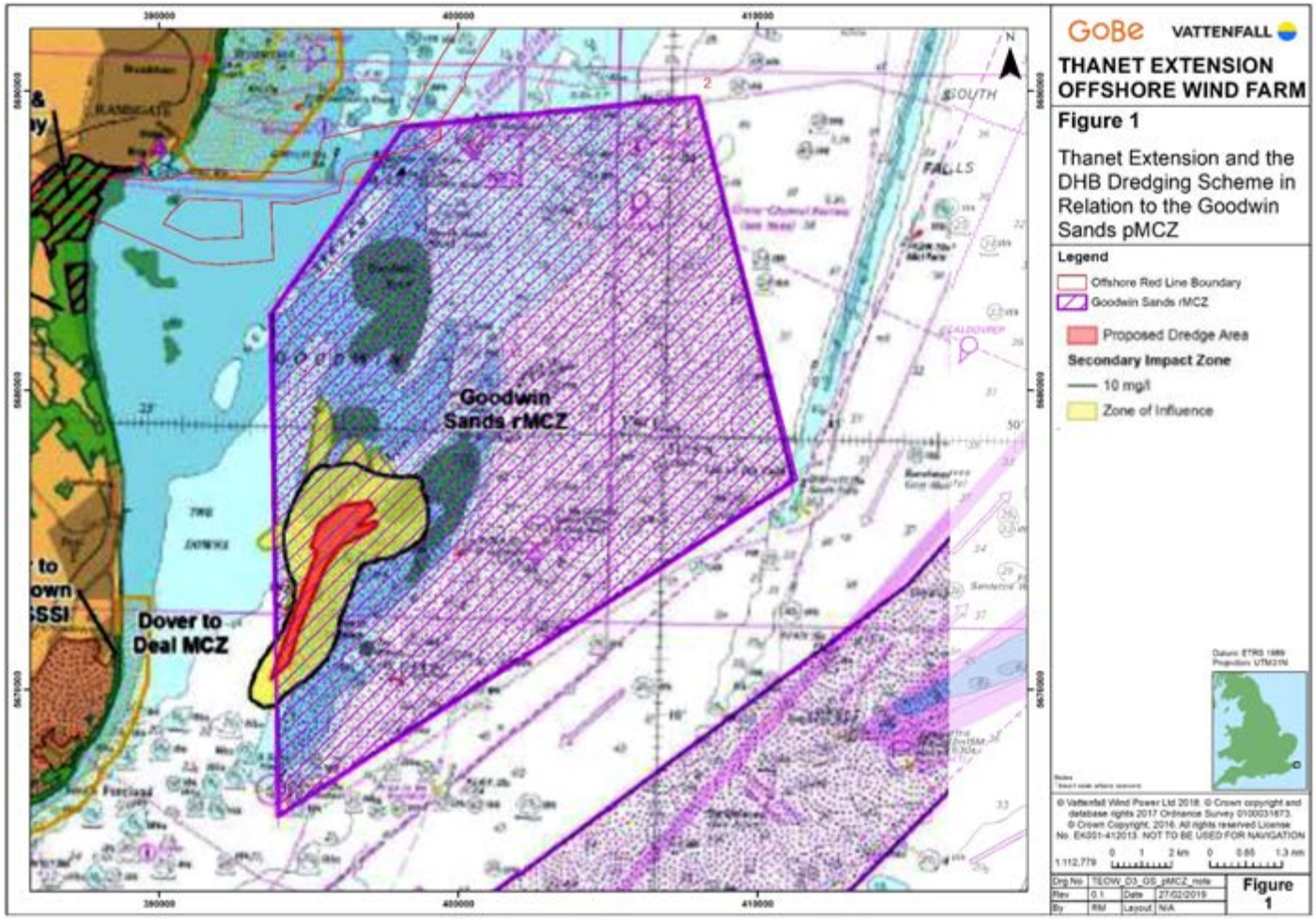


Figure 4 Plan of the DHB dredging scheme and Thanet Extension in relation to the Goodwin Sands pMCZ.

Vattenfall Wind Power Ltd

Thanet Extension Offshore Wind Farm

Annex C to Appendix 32 to Deadline 5 Submission: Marine Conservation Zone Assessment (as submitted in the ES)

Relevant Examination Deadline: 5

Submitted by Vattenfall Wind Power Ltd

Date: April 2019

Revision A

Drafted By:	Vattenfall Wind Power Ltd
Approved By:	Daniel Bates
Date of Approval:	April 2019
Revision:	A

Revision A	Original document submitted to the Examining Authority

Vattenfall Wind Power Ltd

Thanet Extension Offshore Wind Farm

Environmental Statement Volume 4

Annex 5-3: Marine Conservation Zone Assessment

June 2018, Revision A

Document Reference: 6.4.5.3

Pursuant to: APFP Reg. 5(2)(a)

Vattenfall Wind Power Ltd

Thanet Extension Offshore Wind Farm

Volume 4

Annex 5-3: Marine Conservation Zone Assessment

June 2018

Drafted By:	GoBe Consultants Ltd
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5 MCZ Assessment

5.1 Introduction

5.1.1 VWPL is seeking a Development Consent Order (DCO) for Thanet Extension Offshore Wind Farm (Thanet Extension). The proposal is for a wind farm with a total generating capacity of up to 340 MW.

5.1.2 Specific consideration of Marine Conservation Zones (MCZs) is required for any Marine Licence or DCO applications containing Deemed Marine Licences. The Marine Management Organisation (MMO) has specific duties for MCZs and Marine Licence decision making under Section 126 of the Marine and Coastal Access Act (MCAA) 2009. Section 126 applies where:

- (a) A public authority has the function of determining an application (whenever made) for authorisation of the doing of an act; and
- (b) The act is capable of affecting (other than insignificantly):
    - (i) The protected features of an MCZ; and/ or
    - (ii) Any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent.

5.1.3 This report has been produced as an annex to the Environmental Statement (ES) to provide the necessary evidence on the impacts of Thanet Extension on identified MCZs. It follows guidance published by the MMO (2013) on how these assessments should be undertaken. The MCZ assessment has been undertaken on the basis of Thanet Extension project information as detailed within Volume 2, Chapter 1: Project Description (Offshore) (Document Ref: 6.3.1) and Volume 3, Chapter 1: Project Description (Onshore) (Document Ref: 6.3.1).

5.1.4 This MCZ assessment should be read alongside the following chapters of the ES, which are referred to and drawn upon throughout this document:

- Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5);
- Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2);
- Volume 2, Chapter 3: Marine Water and Sediment Quality (Document Ref: 6.2.3); and
- Volume 2, Chapter 14: Offshore Designated Sites (Document Ref: 6.2.8).

5.1.5 In line with the structure proposed in the guidance the report is structured as outlined in Table 5.1:

Table 5.1: Structure of the MCZ assessment

No.	Section	Description
5.1	Introduction	Provides an introduction to Thanet Extension project and the purpose of this MCZ assessment.
5.2	Consultation	Details the feedback received on the MCZ Assessment to date, and how those comments have been addressed.
5.3	Methodology	Includes information on the approach to the MCZ assessment following relevant published guidance, and how information presented in other parts of the ES have been used to support the assessments presented in this MCZ assessment.
5.4	Screening	Presents details of the screening exercise followed to assess which MCZs have the potential to be affected by Thanet Extension.
5.5	Background information MCZs	Provides details on the background of the identified MCZs, such as location and designated features.
5.6	Stage one assessment	Details the stage one assessment exercise, in which potential impacts of Thanet Extension are assessed for effects on the features of the MCZs identified in the screening stage. Potential effects on the habitats and features of the Goodwin Sands recommended MCZ (rMCZ) are also assessed.

Project description

5.1.6 The following paragraphs provide a brief overview of the key components of Thanet Extension. Volume 2, Chapter 1: Project Description (Offshore) (Document Ref: 6.2.1) and Volume 3, Chapter 1: Project Description (Onshore) (Document Ref: 6.3.1) of the ES, which present the project description for the offshore and onshore components of Thanet Extension.

5.1.7 Thanet Extension will have a total capacity of up to 340 Megawatts (MW) and up to 34 Wind Turbine Generators (WTGs). The array area will be approximately 70 km^2 and will be approximately 8 km north-east of the Isle of Thanet, around the existing Thanet Offshore Wind Farm (TOWF).

5.1.8 The Offshore Export Cable Corridor (OECC) will extend from the south-western boundary of the array area in a south-westerly direction to Pegwell Bay on the Kent coast. The OECC will be approximately 20 km in length. As a result of Section 42 consultation, the project has adopted a 'cable exclusion area' within the OECC. This area encompasses the dredged approach channel to Ramsgate Harbour, and a 100 m buffer around the harbour limits. No infrastructure will be installed in this area, however it may be used for anchoring during construction, maintenance and decommissioning activities.

5.1.9 The electricity generated will be transmitted via buried High Voltage Alternating Current (HVAC) cables. From the landfall at Pegwell Bay, onshore cables will connect the wind farm to an onshore substation at Richborough Port, which will in turn connect to an existing National Grid Substation at Richborough Energy Park. The onshore cable corridor will be approximately 2.5 km in length.

5.1.10 The key offshore components of Thanet Extension include:

- Up to 34 WTGs and associated foundations;
- Offshore Substation (OSS) (if required) and its associated foundations;
- Subsea inter-array cables between WTGs;
- Subsea export cables between the wind farm and the shore; and
- Scour protection, concrete mattresses of other protective substrate associated with foundations, cables and cable crossings;

5.1.11 The key onshore components of Thanet Extension include:

- Landfall site with associated Transition Joint Bays (TJBs);
- Onshore undergrounds cables;
- Temporary construction areas; and
- Onshore Substation in proximity to the National Grid connection at Richborough Energy Park.

5.1.12 The Thanet Extension boundaries (referred to as 'Order Limits'), including both onshore and offshore components, were selected following both engineering and environmental considerations. Further details regarding the site selection of Thanet Extension are provided in Volume 1, Chapter 4: Site Selection and Considerations of Alternatives (Document Ref: 6.1.4).

5.2 Consultation

5.2.1 A formal scoping opinion was requested from PINS following the submission of the Scoping Report (VWPL, 2016). Ongoing consultation post-scoping has been important in the evolution of the project and the parameters for assessment. As part of the Environmental Impact Assessment (EIA) process, ongoing consultation has been undertaken with various statutory and non-statutory authorities, under the auspices of the Thanet Extension Evidence Plan (Marine Ecology Technical Review Panel) (Evidence Plan Report (Document Ref: 6.8.5).

5.2.2 In response to the Thanet Extension Scoping Report, PINS issued a Scoping Opinion (PINS, 2017). The Secretary of State (SoS) identified a number of issues that could not be scoped out of the assessment at this stage, based on a review of the Scoping Report. The draft MCZ Assessment was submitted as an annex to the Preliminary Environmental Information Report (PEIR) for statutory consultation under Section 42 of the Planning Act 2008.

5.2.3 The consultation responses relating to the MCZ Assessment which are addressed in this report are presented in Table 5.2.

Table 5.2: Summary of consultation relating to the MCZ Assessment

Consultation phase/ type	Consultation and key issues raised	Section where comment addressed
Scoping Opinion	The SoS notes that at present Section 2.5 of the Scoping Report makes no reference to the Thanet Coast MCZ or the Goodwin Sands rMCZ, any effects to these sites will need to be assessed and presented in the ES.	Effects on the Thanet Coast MCZ are assessed in this report.

Consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		As the Goodwin Sands rMCZ* has not been brought forward for consultation, and the site has no conservation objectives, the site was not included as part of the formal MCZ Assessment at the PEIR stage. However, an assessment of the potential impacts to the habitats and features of conservation importance has now been added to this MCZ Assessment.
Section 42 Consultation: MMO	The MMO notes that the Goodwin Sands rMCZ has been scoped out of the PEIR as it has not been taken forward for consultation, and that consideration has been made with regards to the habitats and features inside the proposed boundary of the Goodwin Sands rMCZ in the benthic ecology chapter. The MMO recommends that an assessment of the rMCZ is undertaken in order to future proof the project as the status may change if it us put forward prior to the proposed project construction. The MMO reiterates that it is the applicant's risk not to include an assessment of the rMCZ.	As the proposed site has not been brought forward for consultation, and in the absence of conservation objectives for the site, a formal MCZ assessment was not undertaken at the PEIR stage. However, a 'proxy' assessment of the potential impacts to the habitats and features of conservation importance of the rMCZ* has been carried out, which makes reference to ES chapters which have already included these within their assessments. Background information on the Goodwin Sands rMCZ* is described in Section 5.5, with potential impacts assessed in Section 5.6.
		Noted. This table (Table 5.2) includes comments received by Natural England, and how they have been addressed.
	The MMO defers to Natural England on the suitability of the assessment of the Thanet Coast MCZ.	
	Annex 8.2: Marine Conservation Assessment contains incorrect references to Annex 5.3, which does not appear to exist.	Typographic errors have been corrected. Document reference numbers have been updated, so that Annex 5.3 now refers to this document.
Section 42 Consultation: Natural England	Natural England advises Vattenfall to consider Goodwin Sands rMCZ within their assessment in order to future proof their project/ application, in line with other developments in the area.	As the rMCZ* has not been brought forward for consultation* and therefore there is some uncertainty as regards conservation objectives, an assessment 'by proxy' has been included, which assesses the potential impacts to the habitats and features of the rMCZ*, but not to the rMCZ* itself. Background information on the Goodwin Sands rMCZ* is described in Section 5.5, with details of this 'proxy' assessment contained in Section 5.6. It is noted that it is the Applicant's risk not to consider the site.
	NE acknowledge and agree that due to the proximity of the proposed project to the Thanet Coast MCZ, a MCZ assessment will be undertaken to assess any likely significant impacts to the MCZ.	
	NE wish to highlight that the decision to designate the Goodwin Sands rMCZ is still under discussion and therefore the impacts to this site may need revisiting in the future if designation is progressed. Vattenfall should consider it within their assessment in order to future proof their project/ application and should follow the route taken by other developers recently, who have considered the site.	
Section 42 Consultation: Kent Wildlife Trust	We have concerns regarding the impact of the cabling route on Thanet Coast MCZ, particularly on the subtidal chalk feature. After reviewing Benthic Characterisation Report Volume 4, Annex 5-2, we do not believe enough sampling has been undertaken within the MCZ to give sufficient	The OECC boundary has been partially amended to avoid cable installation within Thanet Coast MCZ and Ramsgate Harbour limits. This 'cable exclusion

Consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	confidence on the presence or absence of subtidal chalk. Once the removal of a subtidal chalk habitat has taken place, there is no option for the recovery of this habitat; it will be lost in perpetuity, and therefore the conservation objectives of the site would not be met. We suggest that the cabling route avoids Thanet Coast MCZ to reduce any risks to the conservation status of this site. This would also reduce any consenting risks to this development.	area', shown in Figure 5.2, will permit works such as anchor placements, but will not permit cable installation. The exact offshore cable route will be submitted to the MMO for approval following detailed design and pre-construction surveys. As is described in paragraph 5.6.2 *et seq.*, the cables could be installed anywhere within the Red Line Boundary except within the cable exclusion zone, eliminating long-term effects within the area of overlap. This will be shown on the Works Plans as within the Order Limits. Background information on the Goodwin Sands rMCZ* is described in Section 5.5, with details of this 'proxy' assessment contained in Section 5.6.
	KWT cannot support the approach to the MCZ Assessment and therefore the conclusions. The assessment should be against the conservation advice for the site, in this case Thanet Coast MCZ conservation advice. This would reflect the approach being undertaken by Ørsted for Hornsea 3 offshore wind farm and also numerous Inshore Fisheries and Conservation Authorities (IFCAs) undertaking assessments of fishing activities on MCZs. It is of great concern that Vattenfall are at present giving no consideration to the Goodwin Sands rMCZ, and we strongly agree with the advice from Natural England and the SoS's Scoping Opinion in January 2017 that an assessment should be undertaken for Goodwin Sands rMCZ. This would follow best practice undertaken by other offshore wind farm developers. The designation of the Goodwin Sands rMCZ should be considered when assessing cumulative effects of reduction of fishing space and therefore more competition/fishing in areas outside of the Thanet Extension area and the Goodwin Sands area. We also suggest that the section on habitats of nature conservation importance should include consideration of the impact on beds of blue mussels (*Mytilus edulis*), which are a key feature of the Goodwin Sands rMCZ.	
Marine Ecology - Evidence Plan teleconference (26/01/18)	Following several stakeholder comments requesting the inclusion of the Goodwin Sands rMCZ in the MCZ Assessment, this was discussed with the Evidence Plan post-Section 42. After highlighting the lack of certainty as to whether the site will be brought forward for consultation as a fully designated MCZ, an approach was proposed to consider the habitats and features of conservation interest of the rMCZ, but not to fully assess the site in the MCZ Assessment. This approach has been taken as it would be difficult a meaningful assessment in view of the lack of conservation objectives and management measures for the site.	An assessment of the habitats and features of conservation importance of the Goodwin Sands rMCZ* is described in Section 5.6 of this report.

*Note: On 08/06/2018, consultation opened on the third tranche of MCZ designations, bringing 41 proposed sites, including the Goodwin Sands rMCZ. In light of this, the assessment and it's conclusions remain valid. It should be noted that the Goodwin Sands rMCZ Consultation Factsheet (Defra, 2018) identified that cable installation and renewable energy activities are not likely to be damaging to the features of the site.

5.3 Methodology

5.3.1 The 2013 MMO guidance provides the best available guidance on how MCZ assessments should be undertaken. These guidelines recommend a staged approach to the assessment, with three sequential stages: Screening, Stage One Assessment, and Stage Two Assessment (Figure 5.1). Full detail of these stages of the approach have been provided in the following sections.

5.3.2 If certain activities, sites or impacts are screened into the MCZ assessment process, these are then considered within the Stage One Assessment, followed by Stage Two Assessment if significant risks to the achievement of the MCZ conservation objectives have been identified in the Stage One Assessment.

5.3.3 This assessment has considered MCZs that have been designated during the first two tranches of MCZ designations (Tranche One in 2013 and Tranche Two in 2016). MCZs not designated or brought forward for consultation are not required to be considered however the Applicant has undertaken a proxy MCZ assessment for the Goodwin Sand rMCZ which has not been brought forward for consultation at the time of writing (June 2018).

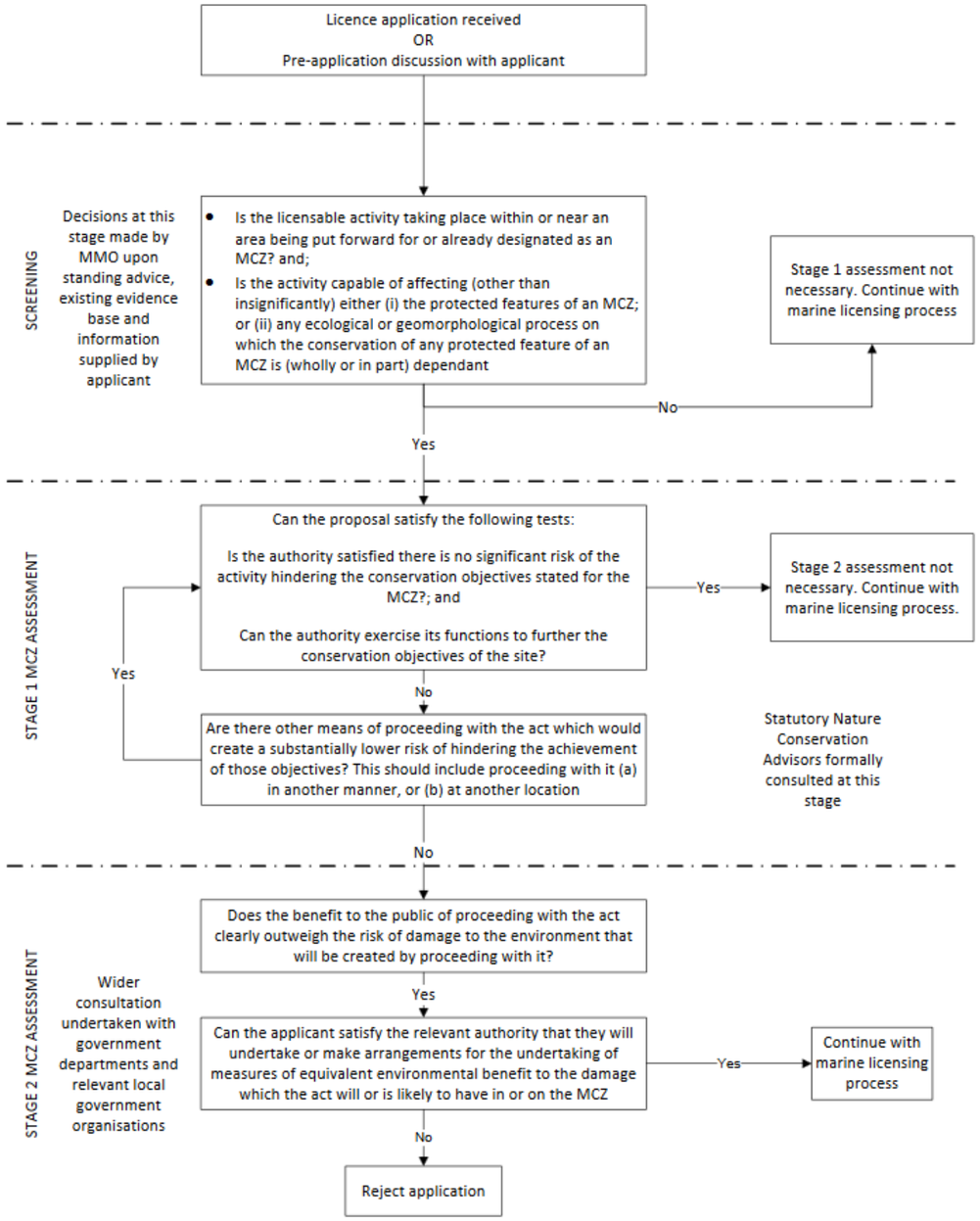


Figure 5.1: Summary of the MCZ assessment process used by the MMO (MMO, 2013).

Screening

5.3.4 According to the MMO (2013) guidelines, all Marine Licence applications need to be screened to determine whether Section 126 should apply to the application. It would apply if it is determined through the course of screening that:

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

5.3.5 The MMO recommends the use of a risk-based approach when determining the 'nearness' of an activity to MCZs, including applying an appropriate buffer zone to the MCZ features under consideration as well as a consideration of risks for activities at greater distances from features of the MCZ(s).

5.3.6 In determining 'insignificance', the MMO considers the likelihood of an activity causing an effect, the magnitude of the effect (should it occur), and the potential risk any such effect may cause on either the protected features of an MCZ or any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant.

5.3.7 For the purposes of Thanet Extension MCZ screening, MCZs considered within the assessment were identified through the Scoping Report (VWPL, 2016) and Scoping Opinion (the Planning Inspectorate (PINS), 2017). The method of defining 'significance' is provided in section 5.3.18 *et seq*.

Stage One Assessment

5.3.8 The Stage One Assessment (if/ as required) would then consider whether the condition in Section 126(6) can be met. In doing so, the MMO would use the information supplied by the applicant with the licence application, advice from the Statutory Nature Conservation Bodies (SNCBs) and any other relevant information to determine whether:

- There is no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ (in accordance with Section 126(6)); and
- The MMO can exercise its functions to further the conservation objectives stated for the MCZ (in accordance with Section 125(2)(a)).

5.3.9 If the condition in Section 126(6) cannot be met, the Stage One assessment would consider whether the condition in Section 127(7)(a) can be met. In doing so the MMO would determine whether there are no other means of proceeding with the act which would create a substantially lower risk of hindering the achievement of the conservation objectives stated for the MCZ. This should include proceeding with it (a) in another manner, or (b) at another location.

5.3.10 In undertaking a Stage One assessment the MMO would formally consult with SNCBs for a period of 28 days unless the SNCB notifies the MMO that it need not wait or the MMO determine that there is an urgent need to grant authorisation (in accordance with Section 126(2).

5.3.11 Within this stage of assessment, 'hinder' would be any act that could, either alone or in-combination:

- 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. these features 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. these features would be placed on a flat or downward trend).

5.3.12 Similarly, 'further' would be any act that 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.

5.3.13 When considering whether an activity can hinder the conservation objectives of a site, the MMO would consider the direct impact of an activity upon a feature as well as any applicable indirect impacts. Such an indirect impact could include changing the effectiveness of a management measure put in place to further the conservation objectives.

5.3.14 The applicant should be able to demonstrate that 'other means' reduces the risk such that the act no longer has a significant risk of hindering the conservation objectives of the site.

5.3.15 In determining 'significant', the MMO (2013) guidance states that 'this should take into account the likelihood of an activity causing an effect, the magnitude of the effect should it occur, and the potential risk any such effect may cause on either the protected feature of an MCZ or any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant'.

Stage Two Assessment

5.3.16 If mitigation to reduce the impacts to an acceptable level cannot be secured, and there are no other alternative locations, then a stage two assessment would be required. Should a stage two assessment be required, this would follow the MMO guidance (MMO, 2013) on the two-staged approach for undertaking an MCZ assessment.

5.3.17 The stage two assessment involves the MMO using information supplied by the applicant with the Marine Licence application, advice from the SNCBs and any other relevant information to determine whether the benefit to the public of proceeding with the act clearly outweighs the risk of damage to the environment that will be created by proceeding with it and if so, whether the applicant can satisfy the MMO that they will undertake or make arrangements for the undertaking of measures of equivalent environmental benefit to the damage the activity will, or is likely to have, in or on the MCZ.

Significance of effects

5.3.18 Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2) and Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5) of the ES have presented assessments of the impacts of Thanet Extension on the physical and ecological marine environment respectively, with definitions of the magnitude of impacts, sensitivity of receptors, and the significance of effects on those receptors. These definitions have also been adopted for the purposes of this MCZ assessment, with the term 'effect' used to express the consequence of an impact. This is expressed as the 'significance of effect' and is determined by considering the magnitude of the impact alongside the sensitivity of the receptor or resource, in accordance with defined significance criteria (Volume 1, Chapter 3: EIA Methodology (Document Ref: 6.1.3)).

Magnitude of impact

5.3.19 For each impact, a magnitude has been assigned, providing a definition of the spatial extent, duration, frequency and reversibility of the impact considered (where applicable).

5.3.20 The magnitude of impact has been categorised according to the following scale, with definitions of these provided in the maximum design scenario tables of Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2) and Volume 2, Chapter 5: Benthic, Subtidal and Intertidal Ecology (Document Ref: 6.2.5) of the ES:

- Negligible;
- Low;
- Medium; or
- High.

Sensitivity of receptor

5.3.21 For the purposes of the MCZ assessment, receptors have been defined as the features of MCZs that would be affected. The features of MCZs with the potential to be affected by Thanet Extension, and therefore considered within this assessment, correspond to the benthic ecological receptors (i.e. habitats and associated species and assemblages) identified within Volume 4, Annex 5.1: Benthic Ecology Technical Report (Intertidal) (Document Ref: 6.4.5.1) and Volume 4, Annex 5.2: Benthic Ecology Technical Report (Subtidal) (Document Ref: 6.4.5.2) and assessed in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5). MCZs themselves are considered in Volume 2, Chapter 8: Offshore Designated Sites (Document Ref: 6.2.8).

5.3.22 In defining the sensitivity for each receptor, the value or importance is usually a key consideration, with all MCZ features considered to be of national importance. When considering sensitivity, it is also important to consider the combined vulnerability of the receptor to a given impact and the likely rate of recoverability to pre-impact conditions. Vulnerability is defined as the susceptibility of a species or assemblage to disturbance, damage or death, from a specific external factor. Recoverability is the ability of the same receptor (species or assemblage) to return to a state close to that which existed before the activity or event which caused the change. For benthic ecological receptors, it is dependent on the ability of these benthic species and assemblages to recover or recruit subject to the extent of disturbance or damage incurred. These definitions have been further discussed in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5).

5.3.23 Similar to the magnitude of impact, the sensitivity of a receptor has been categorised according to the following scale:

- Negligible;
- Low;

- Medium: or
- High

Significance of effect

5.3.24 The overall significance of an effect has been determined by correlating the magnitude of the impact alongside the sensitivity of the receptor. In order to ensure a transparent and consistent approach, a matrix approach has been adopted (Table 5.3).

5.3.25 For the purposes of the MCZ assessment, any effects with a significance level of 'minor' or 'negligible' are considered 'not significant' in terms of the MCAA. In line with the MMO (2013) guidance, the conclusion with respect to the significance of the effect has considered the risk of an activity causing an effect, the magnitude of the effect should this occur, and the potential risks to either the protected features of the MCZ or any ecological or geomorphological process on which these features are dependent.

Table 5.3: Significance of potential effects

		Sensitivity			
		High	**Medium**	**Low**	**Negligible**
Negative Magnitude	**High**	*Major*	*Major*	*Moderate*	*Minor*
	Medium	*Major*	*Moderate*	*Minor*	*Negligible*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*
	Negligible	*Minor*	*Minor*	*Negligible*	*Negligible*
Beneficial Magnitude	**Negligible**	*Minor*	*Minor*	*Negligible*	*Negligible*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*
	Medium	*Major*	*Moderate*	*Minor*	*Negligible*
	High	*Major*	*Major*	*Moderate*	*Minor*

5.3.26 These criteria have been used to inform the MCZ assessment, drawing on findings of the impact assessments presented in the ES. However, in contrast to the approach taken in the EIA process, this assessment has considered the risks that Thanet Extension might pose to the current conservation status of each of the individual MCZ features.

5.3.27 Based on the information presented within this assessment and consideration of the conservation objectives and management approach for the sites and features, conclusions have been made with respect to whether the conditions in Section 126(6) of the MCAA can be met, i.e.:

- There is no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ; and
- The MMO can exercise its functions to further the conservation objectives stated for the MCZ (in accordance with Section 125(2)(a)).

5.3.28 If it cannot be concluded that there is no significant risk of the activity hindering the achievement of the conservation objectives or the management approach for an MCZ, and that mitigation or consideration of the alternative means of proceeding would not create a substantially lower risk of hindering achievement of the conservation objectives, a stage two assessment would be required. Should this be required for Thanet Extension, the relevant parts of the MMO (2013) guidance would again be followed (Figure 5.1).

5.4 Screening

Is the licensable activity taking place within or near an area being put forward or already designated as an MCZ?

5.4.1 The MCZs identified in Section 2.15 (Offshore Designated Sites) of the Scoping Report (VWPL, 2016) as having the potential to be affected by Thanet Extension were the Thanet Coast MCZ, and the Goodwin Sands recommended MCZ (rMCZ). The Thanet Coast MCZ, shown in Figure 5.2 overlaps with Thanet Extension OECC and is approximately 7 km from the array area at its closest point (within one ~ 13 km tidal excursion as identified in Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2)).

5.4.2 As outlined in Section 5.2, it was recommended that the Goodwin Sands rMCZ should also be included in the MCZ Assessment in order to future proof the project. Since the rMCZ has not been brought forward for consultation, there is no obligation for formal consideration of the site within the MCZ Assessment. In addition to this, the lack of certainty with regards to conservation objectives makes any assessment of the impacts to those objectives impractical. As such, an assessment of the impacts to features of conservation importance has been undertaken, with reference to assessments already carried out within Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2) and Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5). More information on the potential effects on the features of the rMCZ are presented below, with background information on the rMCZ being presented in Section 5.5.

Is this activity capable of affecting (other than insignificantly) either (i) the protected features of an MCZ; or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent?

Thanet Coast MCZ

5.4.3 The Thanet Coast MCZ was identified as having the potential to be affected by Thanet Extension in Section 2.15 (Offshore Designated Sites) of Thanet Extension Scoping Report (VWPL, 2017), and has been included due to the site's proximity to Thanet Extension OECC (0 km at its closest point), and array area (7 km at its closest point).

5.4.4 Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2) concluded that increases in Suspended Sediment Concentration (SSC) and associated sediment deposition during cable installation would occur in close proximity to the cable installation activity, with the majority of sediments settling on the seabed within metres of the cable. Fine sediments would be transported over greater distances, but these would be expected to be near background levels within hundreds to a few thousand metres. Sediment deposition due to cable installation would not be likely to settle to a measurable thickness beyond tens to hundreds of metres from the cable, with the majority of disturbed sediments deposited within a few metres of the cable. Sediments released from the drilling and dredging of piles, being released at a greater height in the water column, can be expected to remain in suspension for a longer time and therefore be advected over a greater distance. In the order of hundreds to thousands of metres away from these locations, elevations of SSC above background levels are expected to be very low, and within the range of natural variability (see paragraph 5.6.10 *et seq.*).

5.4.5 Due to the distance between Thanet Extension OECC and the Thanet Coast MCZ (overlapping at the southern end of the MCZ (see Figure 5.2), it can be concluded that there is the potential for a receptor-impact pathway that could result in an effect on the Thanet Coast MCZ. Any potential impacts from the array area and areas of the OECC further away from the Thanet Coast MCZ will more limited and will be confined to the construction phase (effects in the Operations and Maintenance (O&M) and decommissioning phases will be much more limited in extent.

5.4.6 It should be noted that although the Thanet Extension OECC overlaps with the Thanet Coast MCZ, the area of overlap relative to the MCZ is small (0.7 km^2 compared with the total MCZ area of approximately 64 km^2 (1.1%). It is also worth noting that as a result of Section 42 consultation, a 'cable exclusion area' has been introduced to the OECC boundary. This area, encompassing a 100 m buffer around the Ramsgate harbour limits, and the dredged approach channel to the harbour, will not have cables installed within it, however the area may however still be used for anchor placement (see Figure 5.2). The 100 m buffer was deemed to be a sufficient distance in order to ensure a limited effect on the harbour from anchor spreads. In practice, this will mean that long-term effects during the O&M phase are limited to impacts from cable maintenance within the MCZ.

5.4.7 Furthermore, impacts from cable installation within or near the Thanet Coast MCZ are likely to be a series of discrete operations (up to four cable installations but potentially as low as two), and there may well be recovery of affected habitats and species between operations.

5.4.8 Following the MMO guidelines (MMO, 2013), any impacts that are concluded to have a negligible impact (non-significant impact) on benthic ecology receptors (including features of an MCZ) can be screened out and not taken through to the stage one assessment. Impacts which were concluded to have a negligible impact on features of an MCZ are considered to present a sufficiently low risk to its protected features or the ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent, so as to allow these to be screened out at this stage. The following impacts (all of which were concluded to be non-significant within Volume 2, Chapter 5: Benthic Intertidal and Subtidal Ecology (Document Ref: 6.2.5) have therefore been screened out and are not considered in the stage one assessment:

- Direct impacts on benthic ecology from noise arising from foundation installation;
- Colonisation of subsea infrastructure affecting benthic ecology and biodiversity;
- Long-term loss of seabed habitat as a result of the use of cable protection;
- Indirect disturbance to benthic habitats from electromagnetic fields generated by inter-array and export cables; and
- Long-term changes to the seabed habitats from scour effects and changes in sediment regime.

Goodwin Sands rMCZ

5.4.9 The habitats and features within the boundary of the Goodwin Sands rMCZ have the potential to be affected by Thanet Extension. The OECC overlaps with the north-western corner of the rMCZ, covering an area of overlap of approximately 1.13 km^2. The Thanet Extension array boundary is approximately 3.08 km from the rMCZ at its closest point.

5.4.10 Since the Goodwin Sands rMCZ has not yet been brought forward for consultation, and there are no formal conservation objectives of which to assess potential impacts against, a formal MCZ assessment is not proposed to be undertaken for the Goodwin Sands rMCZ. However, in response to consultation (outlined in Table 5.2), an assessment of the potential impacts to the habitats and features of conservation importance is described in Section 5.6 of this MCZ Assessment.

5.4.11 Due to the overlap between the OECC and the Goodwin Sands rMCZ, it can be concluded that there is the potential for a receptor-impact pathway that could result in effects on the habitats and features of conservation importance of the proposed site. As with the Thanet Coast MCZ, any effects from the Array and areas further away in the OECC will be more limited and confined to the construction phase.

5.4.12 Similar to the Thanet Coast MCZ, it should be noted that although there is an area of overlap between the rMCZ and the OECC, which is small in extent compared to the total area of the site (approximately 1.13 km^2 compared to the total 279.28 km^2 of the Goodwin Sands rMCZ, a percentage overlap of 0.4%). The overlap is also partial, and whilst cable installation could take place anywhere within the proposed red line boundary, it is possible that they may be installed further north and not take place within the rMCZ at all. Furthermore, the installation of cables is likely to be a series of discrete operations, and there may be some recovery between these operations.

5.4.13 The potential impacts to the Goodwin Sands rMCZ are expected to be the same as those for the Thanet Coast MCZ, and as such, the same impacts are scoped out of the assessment for the Goodwin Sands rMCZ (paragraph 5.4.8).

Screening conclusions

Thanet Coast MCZ

5.4.14 For the Thanet Coast MCZ, the following impacts are screened into the stage one assessment:

- Construction;
    - Temporary habitat loss/ disturbance due to anchor placements in the Thanet Coast MCZ; and
    - Temporary increases in SSC and associated sediment deposition.
- O&M;
    - Direct disturbance to the seabed from cable maintenance activities.
- Decommissioning: potential impacts are predicted to be not greater than those predicted for the construction and O&M phases, see paragraphs 5.6.24 *et seq*.

Goodwin Sands rMCZ

5.4.15 For the Goodwin Sands rMCZ, the potential impacts screened into the assessment are:

- Construction;
    - Temporary habitat loss/ disturbance due to cable installation activities in the Goodwin Sands rMCZ; and
    - Temporary increases in SSC and associated sediment deposition.
- O&M;
    - Long-term habitat loss due to the presence of cable/ scour protection in the Goodwin Sands rMCZ; and
    - Direct disturbance to the seabed from cable maintenance activities.

5.5 Background information on the MCZs

5.5.1 This section provides a summary of the baseline information for the MCZs considered within the stage one assessment.

Thanet Coast MCZ

5.5.2 The Thanet Coast MCZ partially overlaps with the proposed OECC as shown in Figure 5.2. The MCZ partially overlaps with the Thanet Coast Special Area of Conservation (SAC) and is designated to protect additional features to these designated as part of the SAC. Amongst other features, the MCZ has been designated to protect an area of subtidal chalk that extends seaward from the SAC. The full list of features protected by the MCZ are:

- Subtidal coarse sediment;
- Subtidal mixed sediments;
- Subtidal sand;
- Moderate energy infralittoral rock;
- Moderate energy circalittoral rock;
- Blue mussel (*Mytilus edulis*) beds;
- Peat and clay exposures;
- Ross worm (*Sabellaria spinulosa*) reefs;
- Subtidal chalk;
- Stalked jellyfish (*Haliclystus auricula*); and
- Stalked jellyfish (*Lucernariopsis cruxmelitensis*).

5.5.3 The MCZ is noted as containing examples of a variety of features found within the south-east region, including part of the longest continuous stretch of coastal chalk in the UK, including reefs, cliffs and coves, and it is also the only designated MCZ to protect the stalked jellyfish *L. cruxmelitensis*. Additionally, the MCZ includes an unusual composition of *M. edulis* bed and *S. spinulosa* reefs that have formed a complex intertidal biogenic reef.

5.5.4 The conservation objectives of and MCZ establish whether a feature of the MCZ meets the required state (quality) and should be 'maintained' or falls below the required state and should be 'recovered to favourable condition'. The conservation objectives of the Thanet Coast MCZ are described in Table 5.4.

5.5.5 The location of the Thanet Coast MCZ in relation to Thanet Extension is shown in Figure 5.2. The seabed habitats of the Thanet Coast MCZ according to EU Sea Map data are illustrated in Figure 5.3 and a comparison of EU Sea Map data with site-specific date collected during Thanet Extension benthic characterisation surveys (Fugro, 2016) is shown in Figure 5.6. These figures illustrate that the habitats present within the small area of overlap between the MCZ boundary and proposed offshore development boundary are characterised by patched of fine and coarse sediments. This corresponds with the features subtidal coarse sediment, subtidal mixed sediments, and subtidal sand. Each of these habitats is considered in the following section through reference to the recognised pressures and sensitivities detailed within the Natural England Advice on Operations for Thanet Coast MCZ.

5.5.6 Reference to the mapped features (MAGIC, 2017)[1] obtained from Natural England's 'Conservation Advice for Marine Protected Areas' for the Thanet Coast MCZ reveals limited detailed site-specific information about the extents of its protected features. Figure 5.4 suggests that in the southern portion of the Thanet Coast MCZ where there is some overlap of Thanet Extension and the MCZ, there are features including subtidal chalk, moderate energy infralittoral rock, subtidal mixed sediments, and subtidal coarse sediments.

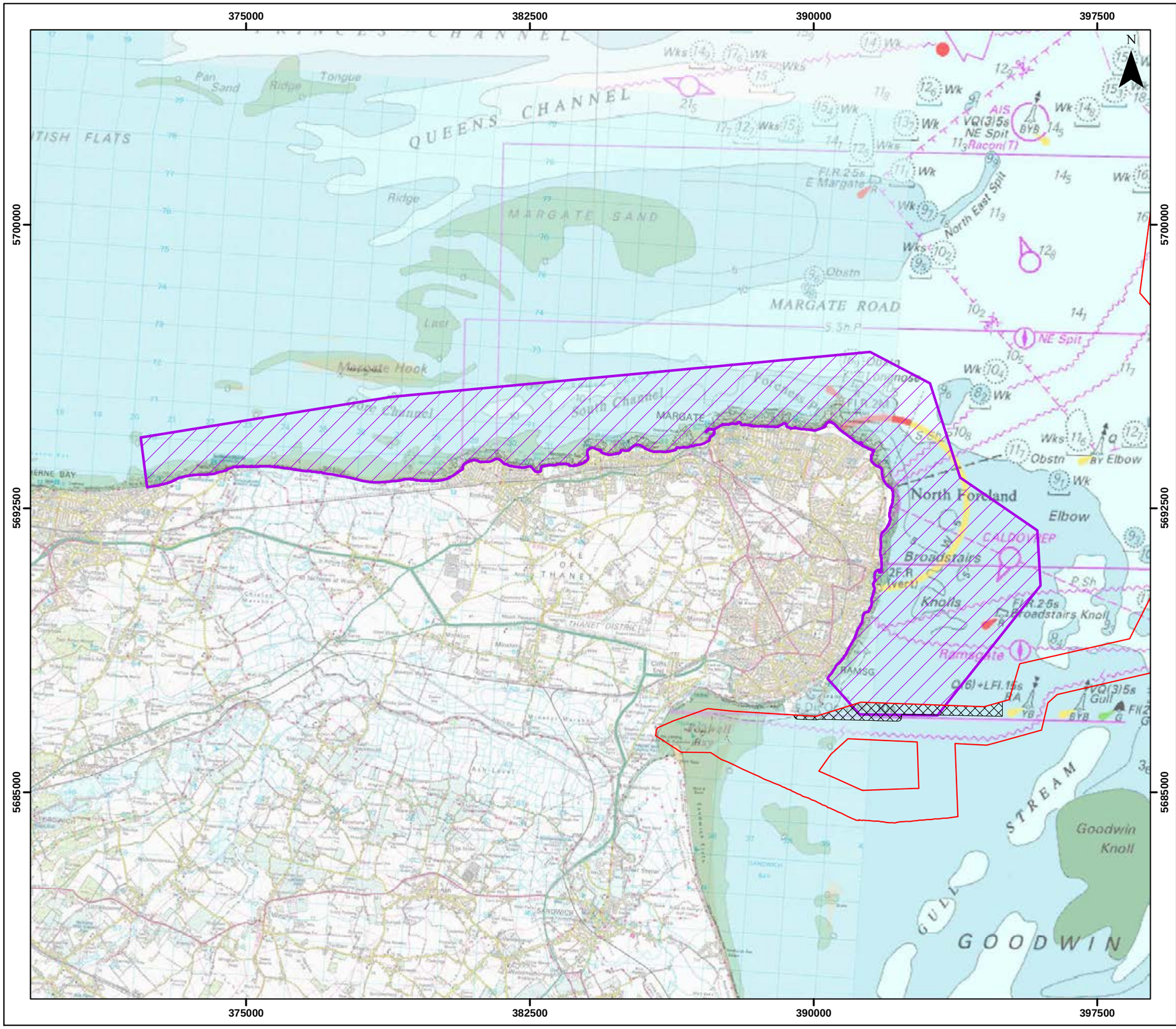
5.5.7 From the point source locations of this data (Figure 5.5), it can be seen that point data is limited in extent for the southern section of the Thanet Coast MCZ with just one datum point that indicates subtidal mixed sediments. This is supported by site-specific data collected by Fugro (2016) (Figure 5.6). It is therefore expected that as indicated in Figure 5.6, features such as subtidal chalk is not located in this overlapping section, and that the site-specific Fugro (2016) data represents a more realistic case of the features present. Any subtidal chalk present is therefore likely to be chalk bedrock overlain with sediment rather than forming exposed outcrops, and will therefore not meet the definition of 'chalk reef'.

5.5.8 Figure 5.4 suggests that in the southern portion of the Thanet Coast MCZ where there is some overlap of Thanet Extension and the MCZ, there are features including subtidal chalk, moderate energy infralittoral rock, subtidal mixed sediments, and subtidal coarse sediments.

[1] MAGIC (Multi-Agency Geographic Information for the Countryside (2017), Natural England [online] Available at: http://www.natureonthemap.naturalengland.org.uk/MagicMap.aspx Accessed: September 2017.

Table 5.4: Conservation objectives for the Thanet Coast MCZ

Feature	Conservation objective/ general management approach
Subtidal coarse sediment	Maintain in favourable condition
Subtidal mixed sediment	Maintain in favourable condition
Subtidal sand	Maintain in favourable condition
Moderate energy infralittoral rock	Maintain in favourable condition
Moderate energy circalittoral rock	Maintain in favourable condition
Blue mussel (*Mytilus edulis*) beds	Maintain in favourable condition
Peat and clay exposures	Maintain in favourable condition
Ross worm (*Sabellaria spinulosa*) reefs	Recover to favourable condition
Subtidal chalk	Maintain in favourable condition
Stalked jellyfish (*Haliclystus auricula*)	Maintain in favourable condition
Slaked jellyfish (*Lucernariopsis cruxmelitensis*)	Maintain in favourable condition



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THANET EXTENSION OFFSHORE WIND FARM

Figure 5.2

Location of the Thanet Coast MCZ in Relation to Thanet Extension

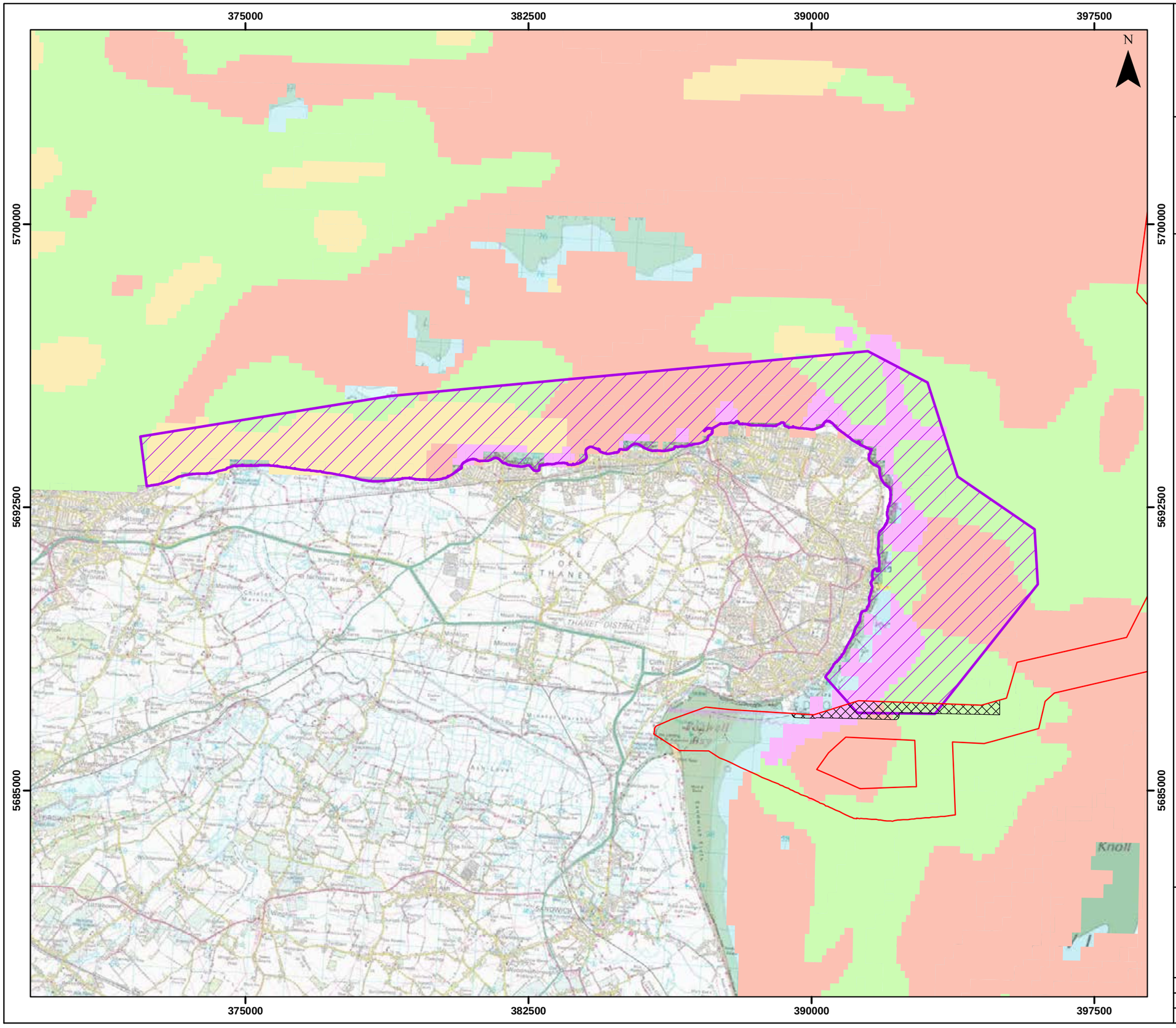
Legend

- Offshore Red Line Boundary
- Cable Exclusion Area
- Thanet Coast MCZ

Datum: ETRS 1989
Projection: UTM31N

1:100,000 0 1 2 km 0 0.55 1.1 nm

Drg No	Fig5.2_ThanCoastMCZLoc			**Figure 5.2**
Rev	0.1	Date	19/05/2018	
By	RM	Layout	N/A	



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THANET EXTENSION OFFSHORE WIND FARM

Figure 5.3

Benthic Habitats in the Thanet Coast MCZ (EU Sea Map)

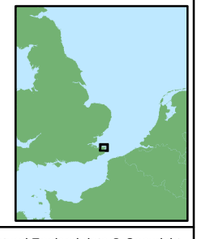
Legend

- Offshore Red Line Boundary
- Cable Exclusion Area
- Thanet Coast MCZ

EU Sea Map Habitats

- Coarse sediment
- Mixed sediment
- Rock or other hard substrata
- Sand to muddy sand

Datum: ETRS 1989
Projection: UTM31N



1:100,000 0 1 2 km 0 0.55 1.1 nm

Drg No	Fig5.3_ThanCoastMCZHabs		
Rev	0.1	Date	25/05/2018
By	RM	Layout	N/A

Figure 5.3

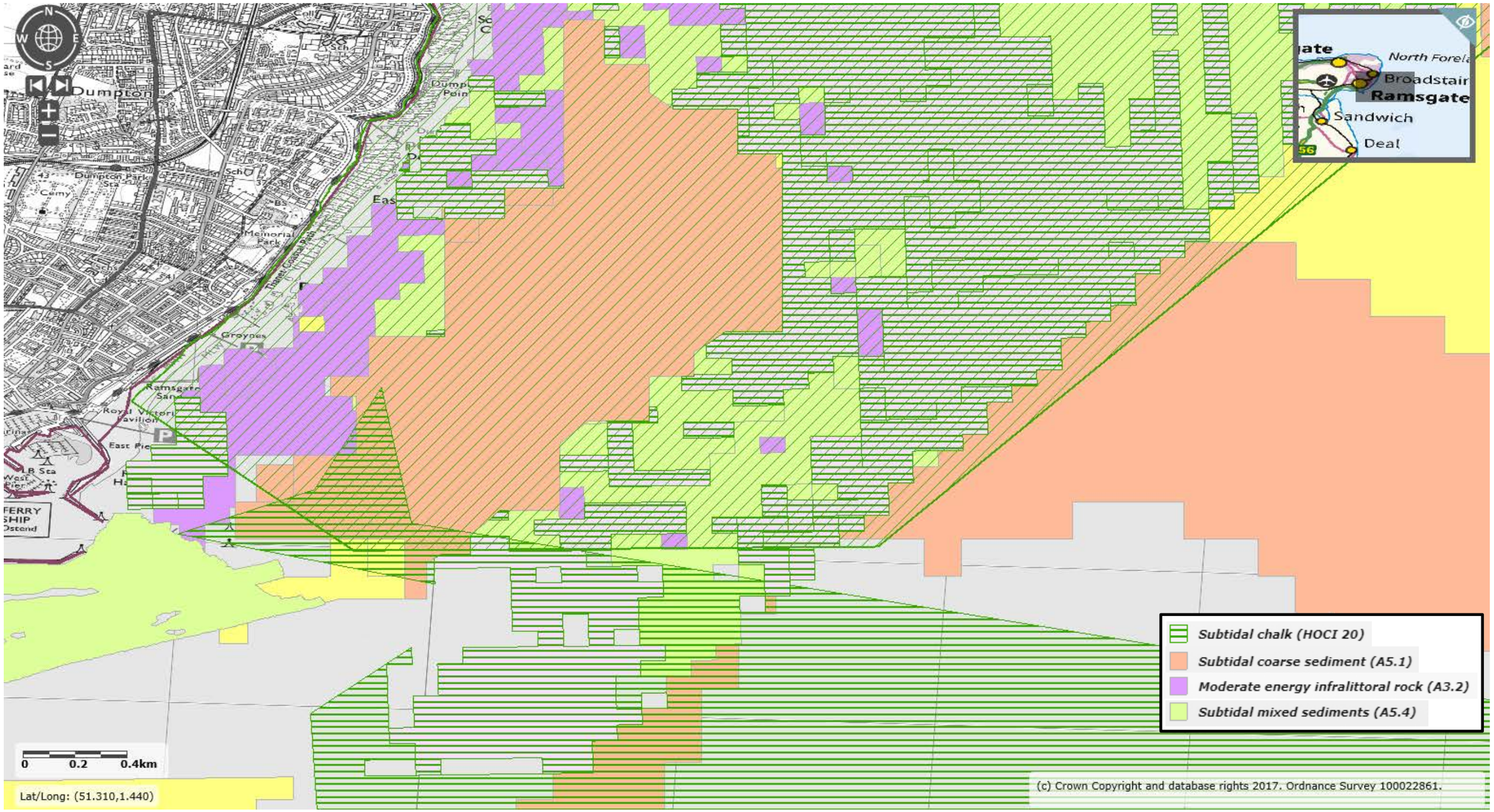


Figure 5.4: MCZ broad scale habitat mapping and habitat features of conservation importance for the Thanet Coast MCZ (MAGIC, 2017).

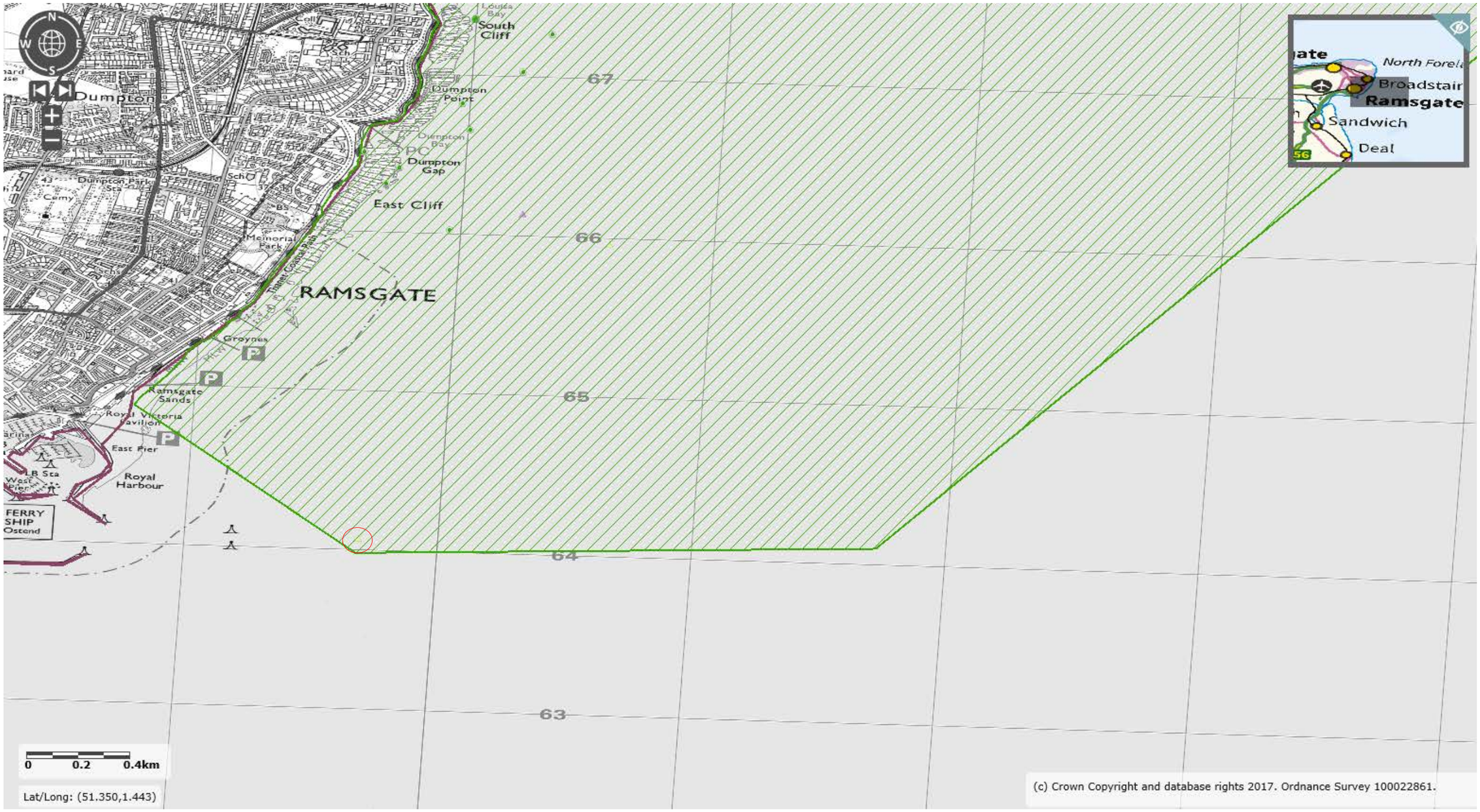
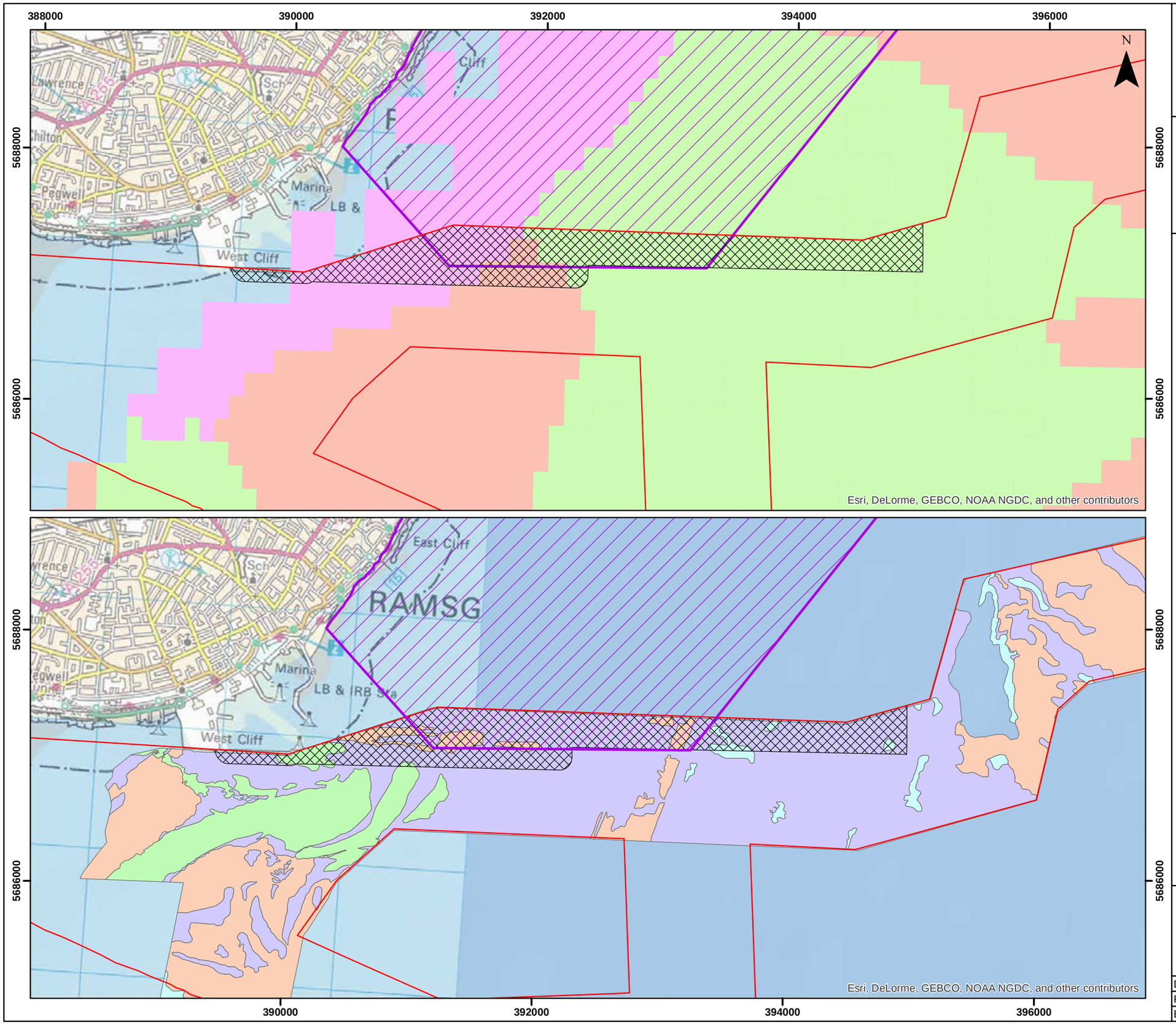


Figure 5.5: Point data sources for the Thanet Coast MCZ protected features (MAGIC, 2017). Red circle highlights the single data point in the overlapping area (subtidal mixed sediments).



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THANET EXTENSION OFFSHORE WIND FARM

Figure 5.6
Comparison of the Benthic Habitats in the Thanet Coast MCZ

Legend

- Offshore Red Line Boundary
- Cable Exclusion Area
- Thanet Coast MCZ

EU Sea Map Habitats (EU Sea Map, 2016) (Top)

- Coarse sediment
- Rock or other hard substrata
- Sand to muddy sand

Sediment Type (Fugro, 2016) (Bottom)

- Clayey to Silty Sand
- Fine to Coarse Sand
- Gravelly Sand
- Sandy gravel

Datum: ETRS 1989
Projection: UTM31N

1:30,000 0 0.3 0.6 km 0 0.15 0.3 nm

Drg No	Fig5.6_ThanCoastMCZHabsC		
Rev	0.1	Date	25/05/2018
By	RM	Layout	N/A

Figure 5.6

Goodwin Sands rMCZ

5.5.9 The Goodwin Sands rMCZ is an inshore site located in the southern North Sea (just north of the English Channel), approximately 5 km offshore of the Kent coast measuring 277 km^2. Goodwin Sands rMCZ is being recommended for inclusion in a network of MPAs in UK waters to address conservation objectives under the MCAA. The location of the Goodwin Sands rMCZ relative to Thanet Extension is shown in Figure 5.7. Goodwin Sands has been proposed for the habitats and features of conservation importance below:

- Broad scale habitats:
    - Moderate energy infralittoral rock;
    - Moderate energy circalittoral rock;
    - Subtidal coarse sediment; and
    - Subtidal sand.
- Habitat Features of Conservation Importance:
    - Blue mussel (*Mytilus edulis*) beds; and
    - Rossworm reef (*Sabellaria spinulosa*).
- Species Features of Conservation Importance:
    - European Eel (*Anguila anguila*);
    - Smelt (*Osmerus eperianus*); and
    - Undulate Ray (*Raja undulata*).

5.5.10 The broad scale habitats 'subtidal sand' along with 'subtidal coarse sediment' are the dominant features, covering 160 km^2 and 116 km^2, respectively. 'Moderate energy infralittoral rock' and 'moderate energy circalittoral rock' cover a comparatively smaller area (1 km^2 each). There are approximately 300 m^2 and 600 m^2 of blue mussel beds and Ross worm reef, respectively. The site is also an important foraging ground for seabirds and has nursery grounds for commercially important fish species such as cod, sandeel and plaice, as well as being one of the two primary seal haul outs in the South East (however these are not proposed as features of the rMCZ).

5.5.11 Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5) provides a detailed description of the Thanet Extension OECC, which coincides with the north-western section of Goodwin Sands rMCZ. This included identification of sediment types and classification of infaunal and epifaunal biotopes, which are shown in Figure 5.9.

5.5.12 Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5) describes the sediments throughout the OECC as generally heterogenous, with a slight patter in large distributions of sediments being generally coarser offshore and finer closer to shore. Large sections of the seabed were broadly flat, with gradients of less than five degrees, with areas of dunes, outcrops and seabed ridges common throughout the OECC, with gradients of up to 35 degrees on some features. Whilst these features are spread throughout the OECC, two distinct areas are particularly characterised by the presence of these features, one in the mid OECC region and the other in the nearshore section of the OECC.

5.5.13 Three biotopes that were identified along the OECC from video surveys. Due to the low level of visibility at the time it was only possible to classify these to a relatively high level. SS.SMx.CMx was the most common biotope, identified at two locations; SS.SSA was the second most common, identified at two locations; and SS.SCS was identified at one location. SS.SMx.CMx is a naturally variable habitat and was reflected in the variety of communities identified, which included polychaetes, bivalves, echinoderms and burrowing anemones. SS.SSA observed in this area was characterised by epibiota comprising of crustaceans, gastropods and echinoderms. SS.SCS was characterised by robust fauna, which included in this case the sea star *Asteria rubens* and sea anemones (Actinaria). The grab samples, whilst providing a more limited coverage of the area than the video survey, enabled classification of the biotopes at each location, inclusive of the infaunal community. The biotopes identified within the OECC were as follows:

- SS.SMx.CMx.MysThyMx in combination with SS.BSR.PoR.SspiMx (Group A); and
- SS.SSa.IMuSa.FfabMag in combination with SS.SSa.IFiSa.NcirBat (Group B).

5.5.14 Group A was identified at one location in the OECC, closest to the array area, whilst Group B was found in the middle and near-shore sections of the OECC.

5.5.15 The location of the broad scale habitats can be seen in the Site Assessment Document (Defra, 2015) and show that the areas of rock and subtidal coarse sediment are located to the south and east of the rMCZ. The section which overlaps with the OECC is composed of subtidal sand and mixed sediments. These broad scale habitats are widespread both within the rMCZ and the surrounding area. The surveys carried out for the Site Assessment Document (Defra, 2015) did not identify blue mussel (*Mytilus edulis*) beds or Ross worm (*Sabellaria spinulosa*) reefs across the whole rMCZ site. The areas that could be identified were located at least 2.5 km to the east and further to the south of the area of overlap with the OECC. The surveys also recorded no species Features of Conservation Importance for the rMCZ.

5.5.16 EU Sea Map Habitats data (Figure 5.8), suggests that the dominant habitat in the area of overlap is ‘Sand to muddy sand’, with a smaller area of ‘Rock or other hard substrata’. However, based on site-specific survey data (detailed in Volume 4, Annex 5.2: Benthic Technical Report (Subtidal) (Document Ref: 6.2.5.2), the broad scale habitats within this area of overlap are ‘Clayey to Silty Sand’, with smaller areas of ‘Fine to Coarse Sand’ and ‘Sandy Gravel’, which are shown in Figure 5.8. Furthermore, data collected in the Cefas 2014 rMCZ Subtidal Verification Survey (and detailed in the Goodwin Sands rMCZ post-survey site report (Defra, 2015)) demonstrates that the habitats in the area of overlap are dominated by ‘Subtidal sand’, with smaller pockets of ‘Subtidal mixed sediments’ and ‘subtidal coarse sediment’. Areas of ‘Moderate energy circalittoral rock’ are not found within the area of overlap and are 8 km from the OECC boundary at the closest point.

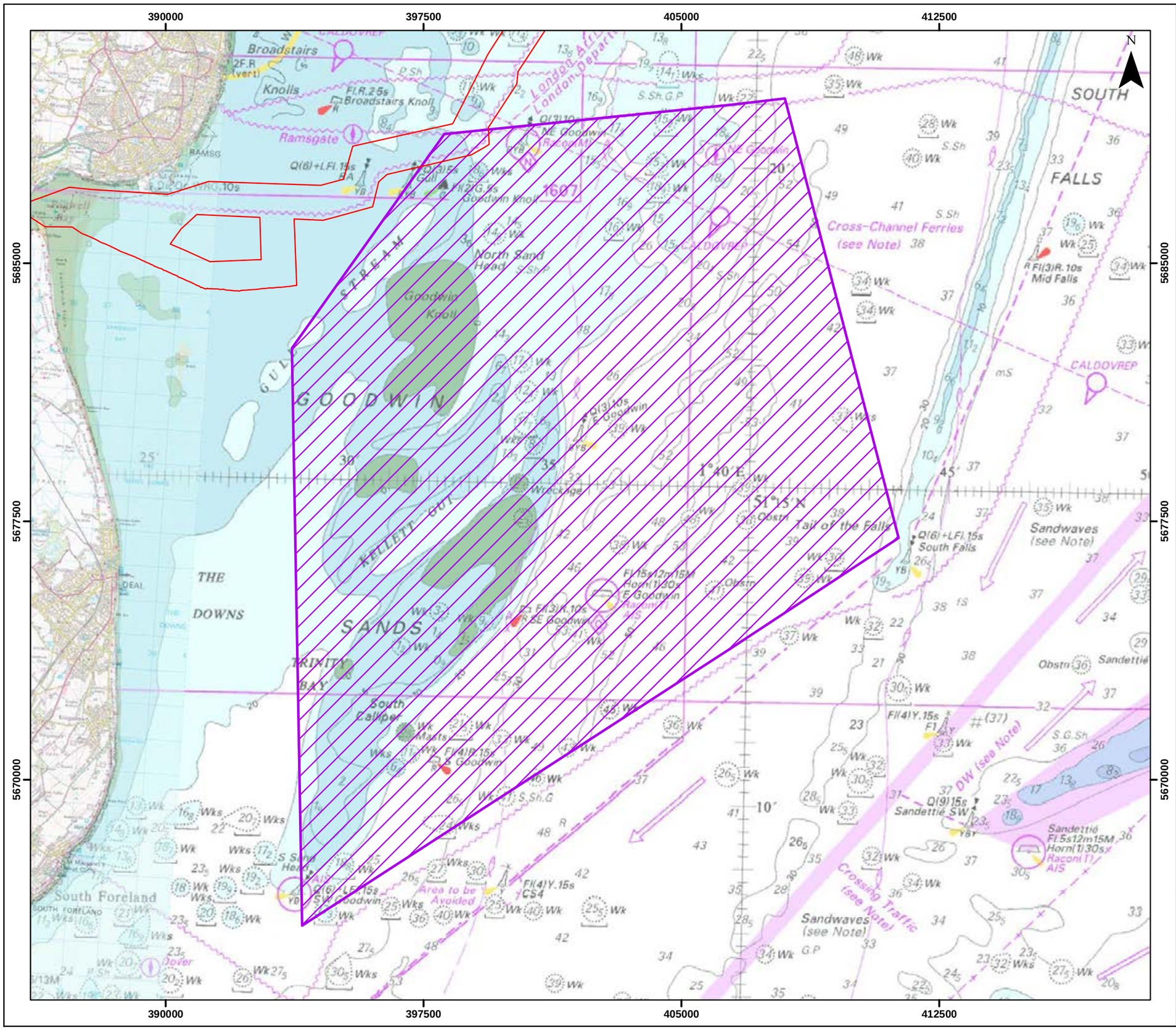

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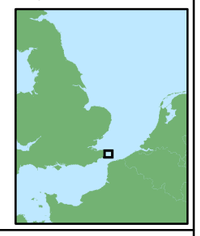
Figure 5.7

Location of the Goodwin Sands rMCZ

Legend

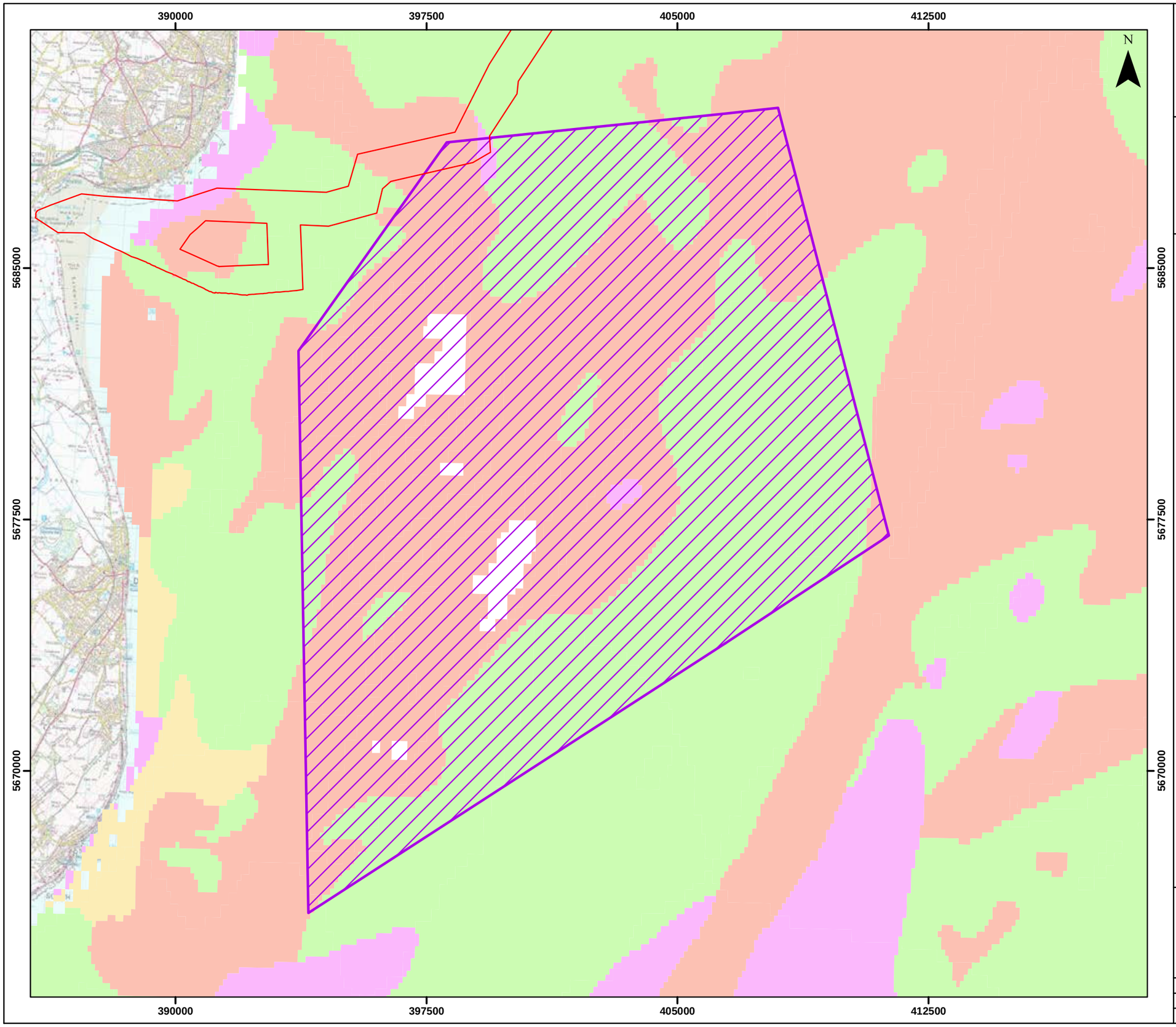
- Offshore Red Line Boundary
- Goodwin Sands rMCZ

Datum: ETRS 1989
Projection: UTM31N



1:110,000 0 1 2 km 0 0.6 1.2 nm

Drg No	Fig5.7_GwinSanMCZLoc			**Figure 5.7**
Rev	0.1	Date	25/05/2018	
By	RM	Layout	N/A	



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THANET EXTENSION OFFSHORE WIND FARM

Figure 5.8

Benthic Habitats in the Goodwin Sands rMCZ (EU Sea Map)

Legend

- Offshore Red Line Boundary
- Goodwin Sands rMCZ

EU Sea Map Habitats (EU Sea Map, 2016)

- Coarse sediment
- Mixed sediment
- Rock or other hard substrata
- Sand to muddy sand

Datum: ETRS 1989
Projection: UTM31N

1:112,690 0 1 2 km 0 0.65 1.3 nm

Drg No	Fig5.8_GwinSanMCZHabs			**Figure 5.8**
Rev	0.1	Date	25/05/2018	
By	RM	Layout	N/A	

394000 396000 398000 400000 402000 404000

5690000 5688000 5686000

N

Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

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Figure 5.9
Comparison of the Benthic Habitats in the Goodwin Sands rMCZ

Legend

- Offshore Red Line Boundary
- Goodwin Sands rMCZ

EU Sea Map Habitats (Top)

- Coarse sediment
- Rock or other hard substrata
- Sand to muddy sand

Sediment Type (Fugro, 2016) (Bottom)

- Clayey to Silty Sand
- Fine to Coarse Sand
- Gravelly Sand
- Sandy gravel

Datum: ETRS 1989
Projection:UTM31N

1:40,000 0 0.4 0.8 km 0 0.2 0.4 nm

Drg No	Fig5.9_GwinSanMCZHabsC		
Rev	0.1	Date	25/05/2018
By	RM	Layout	N/A

Figure 5.9

390000 397500 405000 412500

5685000 5677500 5670000

N

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THANET EXTENSION OFFSHORE WIND FARM

Figure 5.10

2014 Cefas Goodwin Sands rMCZ Subtidal Verification Survey Results

Legend

- Offshore Red Line Boundary
- Goodwin Sands rMCZ

2014 Cefas rMCZ Subtidal Verification Survey - Goodwin Sands

- Moderate energy circalittoral rock
- Subtidal coarse sediment
- Subtidal mixed sediments
- Subtidal sand

Datum: ETRS 1989
Projection: UTM31N

1:110,000 0 1 2 km 0 0.6 1.2 nm

Drg No	Fig5.10_GwinSanMCZCefas			**Figure 5.10**
Rev	0.1	Date	25/05/2018	
By	RM	Layout	N/A	

5.6 Stage one assessment

Thanet Coast MCZ

5.6.1 This MCZ assessment on the features of the Thanet Coast MCZ has been undertaken with reference to the Natural England Advice on Operations for Thanet Coast MCZ. It is noted that the Advice on Operations is not available for Goodwin Sands as a result of the site not being brought forward for assessment. Additional information regarding the screening of potential pressures and the Advice on Operations can be found in Appendix A: MCZ Pressure Screening.

Construction Phase – Temporary habitat loss/ disturbance due to anchor placements

5.6.2 Direct temporary loss/ disturbance of subtidal habitat will occur within the Thanet Coast MCZ as a result of cable installation and anchor placements associated with cable installation. Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5) provides further detail on the magnitude of impact and project envelope assumptions with respect to temporary habitat loss.

5.6.3 The maximum design scenario for cable installation is the installation of four export cables close to, but not within, the cable exclusion area (i.e. not within the Thanet Coast MCZ), resulting in cable laying vessels deploying anchors within this cable exclusion area. With the assumption of 576 anchor deployments per cable installation along the entire 28 km route, the maximum design scenario would be 44 anchor deployments in the ~2 km length of OECC that overlaps with the Thanet Coast MCZ. Each anchor deployment involves six anchors, however only half of these would realistically be deployed within the area of overlap with the Thanet Coast MCZ, as the rest would be deployed on the opposite side of the vessel outside of the area of overlap. As such, a maximum of 132 individual anchor placements would be made within the area of overlap, each impacting an area of 10 m^2 including deployment and recovery. Therefore, based on the conservative assumption that four export cables will be installed the maximum impacted area within the Thanet Coast MCZ as a result of anchor placements would be 1,320 m^2, which represents 0.002% of the total area of the MCZ. Furthermore, it is expected that anchor placements would leave substrates largely intact, although some damage would be expected to the physical structure of the sediments, being relatively minor in areas of flat substrate, or more noticeable in areas where the structural complexity is greater. It is therefore expected that the magnitude of the impact to the Thanet Coast MCZ is Low.

5.6.4 The subtidal habitats and species identified during the benthic characterisation surveys were all identified according to the Marine Evidence Based Assessment (MarESA) criteria as having high or medium recoverability to direct disturbance. The recovery of such communities is likely to occur as a result of the combination of recruitment from surrounding unaffected areas and larval dispersal, and recovery is likely to occur within two to ten years (based on the MarESA assessments). This is supported by evidence relating to the recovery of benthic communities following aggregate extraction activities which have reported that following the cessation of dredging activities, the characteristic recovery time for sand communities may be two to three years. Data from marine aggregate sites off the south and south-east coasts of the UK indicate that following the initial suppression of species diversity, abundance and biomass, recovery of species diversity to within 70 – 80% of that in non-dredged areas was achieved within 100 days (Newell *et al.*, 2004). Species abundance also recovered within 175 days. It is important to note that these activities associated with aggregate extraction involve the complete removal of sediment, whereas activities associated with Offshore Wind Farm (OWF) construction activities only involve temporary disturbance. Data collected from more analogous activities such as the burial of telecommunications cables and OWF monitoring inclusive of that for TOWF (MESL, 2013) indicate that recovery is rapid with limited, if any, significant effects being discernible. The subtidal habitats and species directly affected by temporary habitat loss and disturbance are expected to be of Low sensitivity.

5.6.5 This is also reflected in the Advice on Operations which identifies the features of relevance (i.e. the small area of subtidal coarse sediments within the MCZ) in relation to the assessment of temporary habitat loss/ disturbance is equivalent to the pressure identified for cable laying, burial and protection of 'abrasion/ disturbance of the substrate on the surface of the seabed'. The Advice on Operations (Natural England, 2018) identify that the relevant features have a range of sensitivities from low to medium at the pressure benchmark (physical damage to the habitat). Given the discrete, temporary, and reversible nature of the effect, and the information drawn from the MarESA resources an overall sensitivity is therefore concluded as Low.

5.6.6 Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5) assessed direct disturbance within the subtidal arising from cable installation activities and concluded that impacts would be of minor adverse significance. The magnitude has been assessed as low and the sensitivity of receptors as Low. The effect is therefore deemed to be of **Minor** adverse significance.

5.6.7 With respect to the conservation objectives of the Thanet Coast MCZ outlined in Table 5.4, it can be concluded that there is no significant risk of temporary habitat loss/ disturbance due to cable installation activities hindering the conservation objectives of the Thanet Coast MCZ as:

- Temporary habitat loss/ disturbance is expected to affect a relatively small proposition of the designated habitats of the MCZ during construction, with effects predicted to be short-term and reversible within the extent of the designated features; and

- The structure and function, quality and composition of characteristic biological communities will remain in a favourable condition and will not deteriorate. Recovery of the lost/ disturbed habitats is expected within a few months to 2-3 years of cable installation, although as highlighted in paragraph 5.6.4, this is considered conservative.

Construction Phase – Temporary localised increases in SSC and associated sediment deposition

5.6.8 Increases in SSC and associated sediment deposition are predicted to occur during the construction phase as a result of cable route pre-sweeping, cable installation and pile-dredging. Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2) provides a full description of the physical assessment, including the specific assessment with respect to increases in SSC and subsequent sediment deposition, with a summary of maximum design scenarios associated with this impact presented in the ES chapter.

5.6.9 The installation scenario that represents the worst-case for increases in SSC and associated sediment deposition is the use of energetic means of cable installation (such as jetting and mass flow excavation), which is assumed to result in 100% of the material in the trench being liquidised and dispersed in the lower water column, as well as the drilling of up to 50% of all foundations will drill arisings being deposited at the surface. As the OECC overlaps with the Thanet Coast MCZ, while the array area is ~7 km from the MCZ at its closest point, potential impacts from inter-array cable installation and pile drill arisings potential effects from the array area are expected to be less impacting than those from export cable installation. Due to the implementation of the cable exclusion zone (Figure 5.2), the only direct effects within the Thanet Coast MCZ will result from anchor placements.

5.6.10 Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Process (Document Ref: 6.2.2) concluded that increases in SSC and associated sediment deposition during cable installation would occur in close proximity of the cable installation activity, with the majority of sediments settling within a few metres of the cable. Much of the OECC seabed sediment comprises coarse sand and gravel. As such, cable installation is not expected to create persistent plumes as the coarse material would quickly settle to the seabed (0.05 – 0.5 m/s). Beyond this, increases in SSC are expected to be within the natural variation of background levels, which are generally greater than 10 mg/l, increasing to 30 – 80 mg/l through winter, occasionally reaching up to 100 mg/l; at the seabed, localised increases of several hundred mg/l may be expected during storm events. Due to the low height of release of sediment associated with cable installation, the deposition of materials will be spatially limited to up to approximately 20 m for gravels and up to a few hundred metres for sands. Finer material may be advected over a few thousand metres, but to near background concentrations (tens of mg/l). The distance to which dredged material may spread to an increase in bed level of 5 cm is 150 m from the cable, however it is expected that the extent (and therefore area) of deposition will be smaller for sands and gravels (leading to a greater thickness of tens of centimetres to a few metres near the cable), and that fine material will be distributed more widely, becoming so dispersed that it is unlikely to settle in a measurable thickness.

5.6.11 Increases to SSC and sediment deposition from inter-array cable installation would be similar to the effects described above for export cables and so any changes to SSC would not be expected outside of background levels within the order of kilometres. Any changes to seabed levels would be immeasurable within the Thanet Coast MCZ. For monopile foundations, Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2) predicted that sand sized material could remain in suspension for approximately 15 minutes and may be transported up to approximately 0.5 km, with increases in SSC in excess of natural ranges over a short timescale. Away from release locations (i.e. in the order of hundreds of metres to a few kilometres) elevations of SSC are expected to be very low (~20 mg/l) and within the range of natural variability, becoming indistinguishable from background levels (<5 mg/l) after approximately 24 hours. In practice, measurable elevations to seabed level from the drilling of foundations are not expected beyond discrete deposits within the array area and are therefore not predicted to affect the Thanet Coast MCZ.

5.6.12 Data collected for the benthic characterisation shows that the OECC passes through fine to coarse sand and patches of clayey to silty sand within the Thanet Coast MCZ (Figure 5.6) and does not pass though areas of rock or other hard substrata (e.g. chalk reef) as suggested by the EU Sea Map predictive habitat mapping. As such, it can be expected that cable installation will not take place directly through areas of chalk reef, and so these habitats will not be subject to high levels of sediment deposition. For peat and clay exposures, effects would be expected to be analogous to subtidal chalk.

5.6.13 The impact of increases in SSC and associated sediment deposition on features of the Thanet Coast MCZ is predicted to be of local spatial extent, short-term and intermittent duration, and reversible to the baseline conditions following the cessation of activities. It was predicted in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), that this impact would be of Low magnitude.

5.6.14 Effects from increases in SSC and associated sediment deposition were assessed in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5). The species and habitats identified were assessed as having high recoverability to changes in SSC and associated sediment deposition. The subtidal habitats in the region are accustomed to high levels of SSC that occur naturally and consequently have some level of tolerance to increased SSC and sediment deposition.

5.6.15 The subtidal habitats in the region, including those within the Thanet Coast MCZ, being subject to periodic increases in SSC and associated sediment deposition, are expected to have some tolerance to the effects of increased SSC and deposition. The recoverability of such communities is likely to occur as a result of a combination of recruitment from surrounding areas and larval dispersal, and recovery of those areas directly affected by sediment deposition is likely to occur within two to ten years depending on the depth of burial, with areas that are affected by lighter levels of deposition recovering within two years (based on the MarESA assessments). This is supported for the identified habitats in the area by the post-construction surveys for TOWF, which identified that differences between pre-construction and post-construction (two years after construction) faunal data were only due to natural variation and as such no significant effects were discernible.

5.6.16 This is also reflected in the Advice on Operations which identifies that the features of relevance have a range of sensitivities from not sensitive to low in relation to the pressure 'changes in suspended solids (water clarity). The Advice on Operations bases this sensitivity on the pressure benchmark 'a change in one Water Framework Directive (WFD) ecological status class for one year within site'. Given that the cables will be installed in less than one year, and that cable installation will be a series of discrete operations rather than continuous, it can be concluded that the sensitivities of features in the MCZ will be Low.

5.6.17 The Advice on Operations also provides information on the sensitivities of relevant features in relation to the pressure of 'smothering and siltation rate changes (light)'. The Advice on Operations identified a range of sensitivities from not sensitive to medium, and not sensitive to high for subtidal mixed sediments, based on the pressure benchmark of ''light' deposition of up to 5 cm fine material added to the habitat in a single discrete event'. As described in Section 5.6.10, fine material is not expected to be deposited at a measurable thickness further than a few metres away from the cable. As such, due to the limited spatial extent of the cable installation operations, it can be concluded that these features are of Medium sensitivity.

5.6.18 The species and habitats identified in the benthic characterisation surveys were predicted to have a maximum sensitivity of medium, with the significance of the effects of increased SSC and sediment deposition being **Minor** adverse.

5.6.19 With respect to the conservation objectives of the Thanet Coast MCZ, as outlined in Table 5.4, it can be concluded that there is no significant risk of increases of SSC and associated sediment deposition due to construction activities as:

- The extent of the designated features will not be affected by increases in SSC and associated sediment deposition, remaining stable following the construction phase; and
- The structure and function, quality and composition of characteristic biological communities will remain in a stable condition and will not deteriorate.

O&M Phase – Direct disturbance to the seabed from cable maintenance activities

5.6.20 Direct disturbance and temporary loss of habitat within the Thanet Coast MCZ may occur as a result of export cable maintenance activities. The extent of this impact will small relative to the entire Thanet Coast MCZ, even with the highly conservative assumption that the maximum of all four export cable will be buried near to the MCZ (cables will not be installed in the cable exclusion zone, which covers the area of overlap with the MCZ). The impacts from direct disturbance to the seabed from cable maintenance would be temporary, of short-term duration, and will comprise a single event in each location. It should be noted that beyond survey/ monitoring, cable maintenance is not anticipated as a regular occurrence during the O&M phase. Any maintenance activities would be within the scope described for cable installation in paragraph 5.6.2 *et seq*. As such the magnitude of this impact is considered to be Low.

5.6.21 The Advice on Operations for the Thanet Coast MCZ identify that the relevant features have a range of sensitivities to 'abrasion/ disturbance of the substrate on the surface of the seabed' as identified for the construction phase in Paragraph 5.6.5. Given that no cable maintenance works would take place within the MCZ, as well as the information drawn from the MarESA assessments, and that any works that may occur would be intermittent, short-term and reversible, it can be concluded that the sensitivity of receptors is Low.

5.6.22 As per paragraph 5.6.4 *et seq.*, the habitats and species directly affected by temporary habitat loss/ disturbance have a low sensitivity to disturbance of this nature, and therefore the significance of this effect is predicted to be **Minor** adverse.

5.6.23 With respect to the conservation objectives of the Thanet Coast MCZ as outlined in Table 5.4, it can be concluded that there is no significant risk from direct disturbance to the seabed from cable maintenance activities as:

- The extent of the designated features will not be affected by the temporary disturbance, remaining stable during the O&M phase; and

- The structure and function, quality and composition of the characteristic biological communities will remain in a stable condition and will not deteriorate.

Decommissioning phase

5.6.24 Potential impacts from decommissioning are expected to be no greater than those listed for construction, of project infrastructure is removed from the seabed at the end of the proposed development's operational life.

5.6.25 If it is deemed closer to the time of decommissioning that removal of certain parts of the proposed development would have a greater environmental impact than leaving *in situ*, it may be preferable to leave those parts *in situ*. In this case, the impacts would be no greater than those predicted for the O&M phase.

5.6.26 To date, no large OWF has been decommissioned in UK waters. It is anticipated that any future programme of decommissioning would be proposed developed in close consultation with the relevant statutory marine and nature conservation bodies. This would enable the guidance and best practice at the time to be applied to minimise any potential impacts.

Goodwin Sands rMCZ

5.6.27 As described in Table 5.2, a formal MCZ Assessment of the potential impacts to the Goodwin Sands rMCZ in relation to its conservation objectives is not being undertaken, as the site has not yet been brought forward for consultation and due to the fact there are no conservation objectives, or advice on operations, for the site. In response to consultation, it was agreed that an assessment of the potential impacts on the habitats and features of the rMCZ, which has already been carried out in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Volume 2, Chapter 6: Fish and Shellfish Ecology (Document Ref: 6.2.6) and Volume 2, Chapter 8: Offshore Designated Sites (Document Ref: 6.2.8) would be undertaken. Additional information regarding the screening of pressures and the Natural England Advice on Operations can be found within Appendix A: MCZ Pressure Screening.

Construction Phase – Temporary habitat loss/ disturbance due to cable installation activities

5.6.28 The worst-case scenario for direct disturbance would be that four export cables are required to be installed by energetic means across the area of overlap between the Goodwin Sands rMCZ and the OECC, with each cable covering a distance within this area of approximately 2.5 km (a highly conservative assumption). Assuming a maximum trench width of 10 m, this would result in a maximum area of direct disturbance of 0.1 km^2. This would represent 0.036% of the total area of the Goodwin Sands rMCZ, although as stated before, this is highly conservative, and the actual area directly affected is likely to be significantly lower.

5.6.29 The principle habitats identified in the area of overlap between the OECC and the Goodwin Sands rMCZ as shown in Figure 5.9 ('subtidal coarse sediment', 'subtidal mixed sediments' and 'subtidal sand') are also present in the Thanet Coast MCZ. As described in paragraph 5.6.4 *et seq*., the subtidal habitats and species identified during the benthic characterisation surveys were all identified according to the MarESA criteria as having high or medium recoverability to direct disturbance. It was assessed in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), that impacts from direct disturbance within the subtidal would be of **Minor** adverse significance. With regard to the proposed fish features of the rMCZ, Volume 2, Chapter 6: Fish and Shellfish Ecology (Document Ref: 6.2.6) also assessed effects from direct damage and disturbance arising from construction activities as being of **Minor** adverse significance.

5.6.30 Moderate energy circalittoral rock feature as seen in Figure 5.10, is approximately 3.6 km from the array boundary and approximately 8 km from the OECC at its closest point and as such will not be affected by direct habitat loss and disturbance in any phase of the development.

Construction Phase – Temporary localised increases in SSC and associated sediment deposition

5.6.31 Increases in SSC and associated sediment deposition are predicted to occur as a result of construction activities, seabed preparation and cable installation. Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2) provides a full description of the physical assessment, including a specific assessment with respect to increases in SSC and subsequent sediment deposition. The installation scenario that represents the worst-case for increases in SSC and associated sediment deposition is the use of energetic means of cable installation (such as jetting and mass flow excavation), which is assumed to result in 100% of the material in the trench being liquidised and dispersed in the lower water column, as well as the drilling of up to 50% of all foundations will drill arisings being deposited at the surface.

5.6.32 As described in Paragraph 5.6.10 *et seq.*, effects from increased SSC and sediment deposition are expected to occur in close proximity of the construction activity, with the majority of disturbed material expected to settle within a few metres. It is expected that material would settle quickly, and any increases in SSC would be within the natural variation beyond a few metres. Finer material may be advected over larger distances but is not expected to settle to a measurable thickness beyond a few metres.

5.6.33 As can be seen in Figure 5.10, the OECC passes through areas of subtidal coarse and mixed sediments, and subtidal sand, and that areas of moderate energy circalittoral rock are found approximately 8 km from the OECC at the closest point. As such, areas of moderate energy circalittoral rock will not be subjected to high levels of sediment deposition.

5.6.34 The impact of increases in SSC and associated sediment deposition is predicted to be of local spatial extent, short-term and intermittent duration, and reversible following the cessation of activities. The species and habitats identified were assessed in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5) as having high recoverability to changes in SSC and associated sediment deposition, the habitats in the region are accustomed to high levels of SSC that occur naturally and consequently have some level of tolerance to increased SSC levels and sediment deposition as described in paragraph 5.6.14 *et seq.*

5.6.35 Effects from SSE and associated sediment deposition were assessed in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5) as well as Volume 2, Chapter 6: Fish and Shellfish Ecology (Document Ref: 6.2.6) as being of **Minor** adverse significance.

O&M Phase – Long-term habitat loss/change due to the presence of cable/ scour protection

5.6.36 Long-term habitat loss may occur within the Goodwin Sands rMCZ during the O&M phase where cable protection is required for sections of the offshore export cables. Export cables are expected to be buried for the majority of the export cable route, only requiring additional cable protection where burial to the target depth is not achievable. It has been assumed that 25% of the cable route may require additional cable protection. Based on the conservative assumption that 100% of the cable route that passes through the overlapping area (2.5 km) will require additional protection on the maximum four cables, and assuming a maximum cable protection width of 7 m, this would result in the loss of ~0.7 km^2 within the rMCZ, equivalent to 0.25% of the total area of the rMCZ.

5.6.37 Whilst the impact will be locally significant and result in a permanent change of seabed habitat, the area affected will be highly localised. Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5) assessed all biotopes as having high sensitivity to habitat loss/ change to a different seabed type as this is, in effect, a complete loss of the existing habitat and consequently there can be no recovery, although species may remain or recolonise the area. Given that the sedimentary habitats are widespread throughout the rMCZ, and that the rMCZ also contains hard substrate outcrops (chalk), the introduction of a relatively limited area of new hard substrate will not represent a significant change from the baseline environment within the MCZ. The significance of the effect of long term habitat loss was assessed as **Minor** adverse.

O&M Phase – Direct disturbance to the seabed from cable maintenance activities

5.6.38 Direct disturbance and temporary habitat loss within the Goodwin Sands rMCZ may occur as a result of export cable maintenance activities, although the extent of this will be small relative to the entire rMCZ. The impacts would be temporary, or short-term duration and intermittent, and would be similar to those described in paragraph 5.6.20 *et seq.* It should be noted that beyond survey and monitoring, cable maintenance is not anticipated as a regular occurrence during O&M.

5.6.39 The habitats and species directly affected by temporary habitat loss/ disturbance have a low sensitivity to disturbance of this nature, and the significance of this impact, as predicted in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5) is considered to be **Minor** adverse.

Decommissioning phase

5.6.40 Potential impacts from decommissioning are expected to be no greater than those listed for construction, of project infrastructure is removed from the seabed at the end of the proposed development's operational life.

5.6.41 If it is deemed closer to the time of decommissioning that removal of certain parts of the proposed development would have a greater environmental impact than leaving *in situ*, it may be preferable to leave those parts *in situ*. In this case, the impacts would be no greater than those predicted for the O&M phase.

5.6.42 To date, no large OWF has been decommissioned in UK waters. It is anticipated that any future programme of decommissioning would be proposed developed in close consultation with the relevant statutory marine and nature conservation bodies. This would enable the guidance and best practice at the time to be applied to minimise any potential impacts.

5.7 References

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Appendix A: MCZ Pressure Screening

The table below summarises the Advice on Operations provided by Natural England for the Thanet Coast MCZ. Since there are similarities between the habitats and features of the Thanet Coast MCZ and the Goodwin Sands rMCZ, the advice provided for the Thanet Coast MCZ have been used as a proxy for the Goodwin Sands rMCZ in the absence of Advice on Operations or Conservation Objectives for the site. Only pressures which are described as 'High-Medium Risk' have been included.

Pressure	Habitat/ feature									
	Peat and clay exposures	Moderate energy infralittoral rock	Blue mussel beds	Subtidal chalk	Ross worm reefs	Subtidal coarse sediment	Subtidal mixed sediments	Subtidal sand	Moderate energy circalittoral rock	Stalked jellyfish (*Calvadosia cruxmelitensis*)
Power cable: laying, burial and protection										
Abrasion/disturbance of the substrate on the surface of the seabed	S	S	S	S	S	S	S	S	S	S
Changes in suspended solids (water clarity)	NS	S	NS	S	NS	NS	S	S	NS	S
Penetration and/ or disturbance of the substratum below the surface of the seabed, including abrasion	S	S	S	S	S	S	S	S	S	-
Smothering and siltation rate changes (light)	S	S	S	S	NS	S	S	S	S	S
Power cable: operation and maintenance										
Abrasion/disturbance of the substrate on the surface of the seabed	S	S	S	S	S	S	S	S	S	S
Changes in suspended solids (water clarity)	NS	S	NS	S	NS	NS	S	S	NS	S
Penetration and/ or disturbance of the substratum below the surface of the seabed, including abrasion	S	S	S	S	S	S	S	S	S	-
Smothering and siltation rate changes (light)	S	S	S	S	NS	S	S	S	S	S