Date: 21 July 2016
Our ref: 187363
Your ref: MLA/2016/00227

David Morris
Marine Licensing Case Officer
Marine Management Organisation
Lancaster House
Hampshire Court
Newcastle Upon Tyne
NE4 7YH

VIA WEBSITE ONLY

Dear David

Re: MLA/2016/00227 Application (Aggregate dredging) Goodwin Sands Aggregate Dredging Scheme.

Thank you for your consultation dated 3rd June 2016 requesting Natural England's advice on the Environmental Statement provided by Haskoning DHV Ltd consultants in support of Dover Harbour Board's (DHB) application for a license to dredge aggregates in Area xx (Goodwin Sands). The following constitutes Natural England's formal statutory response.

Natural England's advice is provided to inform the Marine Management Organisation (MMO), and the applicant, as to the suitability, in nature and extent, of the Environmental Statement (ES), particularly regarding nature conservation receptors.

The advice in this document is offered to assist the MMO in reaching a view on:

1. The possible impact upon habitats and species of recommended Marine Conservation Zones under the Marine and Coastal Access Act 2009; and
2. In relation to The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended).

Our response consists of 2 parts.

Part 1) Presents our comments regarding changes that we feel are required to the relevant sections of the Environmental Statement (ES)[1], along with suggested license conditions[2]; and

Part 2) Outlines Natural England's opinion regarding the potential risk the application poses to the Goodwin Sands Recommended Marine Conservation Zone.

In summary, Natural England concurs with the conclusions of the Environmental Impact Assessment, with suggested amendments, and providing suitable conditions to the consent are applied, does not believe the application poses a significant threat to the Goodwin Sands rMCZ.

[1] Summarised in Annex 1.
[2] Summarised in Annex 2

PART 1: Natural England has the following comments in relation to the relevant sections of the Environmental Statement (ES).

1) **Section 2.10 Best Practice and Mitigation Measures**

It is essential that the marine license includes the following standard marine aggregate industry condition.

Condition

The license holder must ensure that upon cessation of dredging the sediment substrate must be of a similar grade to the conditions that existed before dredging commenced with due allowance being made for natural sediment movements. A specification as to how this will be demonstrated must be agreed in writing with the MMO prior to any surveys or dredging taking place.

Reason

To allow re-colonisation of the seabed upon cessation of dredging activity.

1.1 Monitoring

DHB have stated they will undertake monitoring to ensure potential impacts stay within acceptable levels. It is standard practice in marine aggregate applications for monitoring work to feed into an adaptive management plan and we expect a similar license condition to be ascribed for the Goodwin Sands application. The ES states the exact details of this monitoring plan have been deferred until after the license has been granted. We disagree and feel DHB should agree a monitoring plan prior to the license being consented. Development of the monitoring plan and review of the monitoring data should include Natural England, CEFAS and other relevant stakeholders such as the Wildlife Trust.

Importantly the monitoring plan should state the following points and these should be conditioned as part of the marine license:

- The monitoring plan will use the 'limits of acceptable change' methodology adopted by the wider marine aggregate industry as defined by Cooper (2012). DHB have previously agreed to use this methodology but it is not directly referred to in the ES.

  The 'limits of acceptable change methodology should be used as it defines the sediment particle size composition naturally found in association with specific faunal assemblages in the vicinity of the dredge site. Because variations in infaunal assemblages often correlate strongly with sediment type, deviations from the baseline particle size composition could prevent recolonization of the faunal assemblage found prior to dredging. Monitoring changes in particle size therefore over the life the project means mitigation can be taken if unacceptable changes are observed. Mitigation options could include changes in dredge intensity or dredge methodology.
- DHB have proposed that seabed monitoring/surveys will be undertaken after the cessation of dredging, in phase 3. We feel that monitoring/survey work actually needs to occur throughout the life of the project to ensure that any adverse impacts are observed early and in time for adaptive management or mitigation to be employed. We thus recommend that the next phase of monitoring occur after phase 1 and or potentially phase 2. The decision on when the next survey should occur will depend on the quantities likely to be removed in each phase and agreed as part of a monitoring plan, developed in discussion with CEFAS and other stakeholders. There should however be scope in the marine license for monitoring after every phase of dredging.

Condition

In line with standard practice and prior to the commencement of dredging, develop a robust monitoring plan that uses the 'limits of acceptable change' methodology, which is undertaken throughout the lifetime of the project and feeds into an overall adaptive management plan.

Reason

To ensure that any potential impacts from the dredging activity remain within agreed acceptable levels.

Condition

After each phase of monitoring, there should be a substantive review period.

Reason

To ensure that best practice is being followed and that any required operational changes are made.

1.2 Capping layer

The DHB propose to retain a layer of sand 0.5 metres thick over the underlying bedrock/substratum i.e. they will not dredge areas where the sand is 0.5m or less. A layer of 0.5m is considered the minimum depth of sediment required to support an infaunal community. The retention of sufficient sediment is vital to ensuring there is no loss in extent of subtidal sand habitats.

Due to the fact that the subtidal sand could be a designated feature in the future we feel the capping layer should be increased to 1m, i.e. they cannot dredge areas where the sand is <1m. In our opinion increasing the capping layer to 1m will compensate for the increased mobility of sediment on the sand bank edge. Without the increased capping layer there is the potential that natural sediment changes, such as those resulting from a storm event, could reduce the thickness of dredged areas, to below 0.5m, resulting in an effective loss of functional subtidal sand habitat.

Condition

Increase the sediment capping layer from 0.5m to 1m.

Reason

In order to mitigate for potential unforeseen natural sediment changes which may reduce the sediment layer to less than 0.5m and therefore have an impact on the function of the subtidal sand habitat.

2) Section 2.11 Consideration of Alternatives

Natural England believes that aggregate dredging within marine protected areas or within areas which have been identified for potential future protection should be avoided wherever possible. The ES does not provide sufficient reasoning as to why aggregate could not be obtained from existing sources. Specifically, the discussion of alternatives does not mention specific extraction areas in the Outer Thames or East English Channel.

Whilst we do not feel the Goodwin Sands dredge proposal will have an impact on the long term viability of the recommended Marine Conservation Zone, there will, never the less be some temporary effects on the site whilst dredging is taking place which would ideally be avoided through the use of existing aggregate sources.

3) Section 3.4.2: Marine Plans

The process of producing the South East Inshore Marine Plan has actually now commenced, with consultation on the Statement of Public Participation and the Sustainability Appraisal Scoping Report Document undertaken.

4) Section 6 Coastal Processes and Hydrodynamics

The hydrodynamic modelling work is based on two seabed lowering/dredge scenarios both of which use overly large extraction volumes of 4 million m^3 compared to the 2.5 million m^3 that will be licensed for removal. This provides a level of precaution to the assessment, however, the dredging scenarios use relatively modest seabed lowering levels, these are:

- Scenario 1, dredging 1.12 m depth of aggregates in Area 1
- Scenario 2, dredging 1.95 m depth of aggregates in Area 2

Section 2.6 of the ES states that the area to be dredged will be lowered within the range of 1 – 4m, which is considerably more than has been modelled by the physical processes study which under pins the EIA (shown above). If DHB dredges below the levels used in the modelling study scenarios, then the conclusions of the EIA will be invalidated. It is important that that DHB do not dredge below these levels and this must be enforced by a license condition and verified by monitoring.

Condition

No dredging should occur below the levels used in the modelling study scenarios. This should be verified as part of the monitoring and enforcement process.

Reason

If dredging occurs below these levels (1.12m and 1.95m) then the conclusions of the EIA will be invalidated.

The application proposes to remove 2.5 million m^3 of sand from the south Caliper sand bank which is a major feature of the Goodwin Sands complex. The ES identifies that there is little transfer of sediment between the Goodwin Sands and surrounding areas of sea. In addition the historical bathymetric analysis has also shown that the volume of the Goodwin Sands has remained relatively stable over a number of years. Consequently it appears that the Goodwin Sands complex is a relatively closed system .The removal of large quantities of sediment will therefore reduce the overall quantity of sediment in the system.

Whilst the quantity of material removed (2.5million m^3) is likely to be a very small proportion of the overall volume of sand present in the Goodwin Sands sediment system, the EIA should state whether this reduction in the total quantity of sand present could result in any measurable or significant topographic change to the sandbanks.

Observation

The MMO should note that our interpretation of the physical processes modelling study is based on the presumption that the techniques and methodologies used are technically sound and that appropriate validation of the models has taken place. Natural England does not have the technical expertise to critique the modelling techniques used and we defer this role to CEFAS who have appropriate expertise in this discipline.

5) Section 7 Marine Water and Sediment Quality

Natural England defers comments regarding water quality and sediment contaminant action levels to the Environment Agency (EA) and Cefas respectively.

6) Section 8 Benthic Ecology

8.1 Section 8.5.2 of the ES describes the license area as being dominated by subtidal sand biotopes which are likely to show strong recovery to the physical disturbance created by dredging. There is however a small area of circalittoral coarse sediment EUNIS biotope A5.14 (an rMCZ feature) in the north eastern corner of the exploration area. This biotope type will likely not show the same high levels of recovery as subtidal sand and is likely to be more sensitive to dredging. It is not clear from the maps present e.g. figure 14 of appendix 8.1, whether this biotope is present in the new smaller proposed license area. A map is required which shows the extent of circalittoral coarse sediment biotopes (and individual grab stations results) overlaid on the boundary of the new proposed extraction area. Currently biotope maps are only shown in relation to the original larger exploration area.

It is likely that much of the coarse sediment biotopes are no longer included in the license area due to a reduction in the northern limits of the site. However if the license area does overlap with circa littoral coarse sediment biotopes it would be advisable that the dredging is excluded from taking place on coarse sediment due to their higher sensitivity.

Condition

Exclude dredging from areas of circalittoral coarse sediment.

Reason

In order to reduce potential impacts to the circalittoral coarse sediment biotope (EUNIS A5.14) which has a higher sensitivity than the subtidal sand biotopes which dominate the dredging area.

7) Section 9 Fish Ecology

Sandeel are an important part of the marine ecosystem and display strong site fidelity. The beam trawl surveys undertaken as part of the EIA caught a significant number of sandeel in the dredge site e.g. 57 in one trawl and 66 in another; in addition the grab samples also returned 4 individuals (*Ammodytes marinus).* Neither of these survey techniques are ideal methods to sample sandeel nor were they timed to sample the highest number of individuals. This raises the question as to whether more sandeel could have been recorded if the surveys had specifically targeted them.

Due to the significant use of the extraction area by sandeel there is a risk that a number of sandeel will be entrained and removed by dredging. The risk increases due to the fact that dredging will take place at night and during the winter when sandeel spend a greater time in or close to the seabed sediment.

The survey returned a number of sandeel species both *Ammodytes s*p. and *Hyperoplus lanceolatus*. *Ammodytes marinus is listed as* a species of principle importance under section 41 of the 'Natural Environment and Rural Communities Act (NERC) 2006'. The fact that *Ammodytes marinus* is listed under section 41 means that public bodies when implementing their duty under section 40 of the NERC Act 2006, must have regard to the conservation of this species when carrying out their normal functions.

8) Section 10 Marine Mammals

8.1 Protection to seals

In England, both the harbour and grey seal are protected from direct harm by national and international legislation:

- The Conservation of Seals Act 1970;
- The Wildlife and Countryside Act 1981 (section 11); and
- The Habitats Directive (listed on Annex II and V).

In terms of disturbance (the main impact with regards aggregate extraction) the fact that seals are listed on Annex II of the Habitats Directive means that Special Areas of Conservation (SACs) must be set up to protect grey and harbour seals. Within these SACs, competent authorities have to take appropriate steps to avoid significant disturbance to the species. However, there are no SACs for either species in the vicinity of Goodwin Sands.

8.2 Distribution and abundance

Section 10.4.4 of the ES refers to telemetry is based on tagged seals, and this data is limited for the area. Therefore, we believe that, the importance of the whole region including Goodwin Sands may be underestimated for both harbour and grey seals.

During the 2015/16 breeding season, more seals were born at Blakeney than Donna Nook. This is therefore not a small colony and the text should be amended to reflect this.

8.2 Seal Mitigation

In terms of the marine mammal section of the ES, we agree with the species being reviewed, the possible impacts and the conclusions drawn. We also agree with the proposed mitigation. However we have some comments and further recommendations to makes.

It is clear that the Goodwin Sands area is important for both harbour and grey seals, accounting for 19-27% and 75% respectively, of all seals in the Greater Thames area. While these areas have no nature conservation designations for the populations of seals, best practice should be employed to minimize disturbance to these species at sensitive times of the year (pupping and moulting[3]), especially as the English population of common seals has only recently recovered and stabilised at pre-1988 and 2002 phocine distemper virus (PDV) epidemic numbers and the UK population overall is in decline.

We would like to see further discussion around the methods of mitigation to avoid these sensitive times of year and suggest potential options could include removing aggregate earlier in the year and storing it on land for 2018 and 2019, or altering construction schedules, neither of which have been discussed in the ES. In addition, a standard condition should be included to ensure that transit routes are chosen to avoid known haulouts and the same route to and from the dredging site should be used as far as possible.

Condition
Vessel transit routes should be chosen to avoid known harbour and grey seal haulout sites and a consistent route to and from the dredging site should be used as far as practical.

Reason
So that seals are not disturbed unnecessarily during their important life stages.

[3] Harbour seals tend to pup during June and July and moult in August. Grey seal pupping and moult season is December/January.

While we also agree with the proposed exclusion zone around the known seal haulouts (section 10.6.2 of the ES) of 0.5km at all times and 1km during sensitive life stages, we suggest the zone is kept at 1 km at all times, with the Marine Mammal Observer monitoring for disturbance of seals into the water, especially during sensitive times of the year.

Condition

The dredging exclusion zone around known seal haulout sites should be 1km at all times, including during sensitive life stages.

Reason

This will ensure life stages that may not be apparent to an observer (e.g. pregnant seal or just weaned pup) where animals are more vulnerable to disturbance are also protected.

Natural England agree with the presence of a Marine Mammal Observer on board the dredger during the first year of extraction and believe that this should be a condition of the license. This should be extended into the second year to monitor any impacts of disturbance on mothers and pups (as the first year doesn't cover this time period). We agree that the decision as to whether a Marine Mammal Observer is required for the third dredge phase should be made after reviewing the observations from Phase 1 and 2. This decision should be made in consultation with Natural England and other relevant stakeholders as part of the adaptive management process.

Condition

A Marine Mammal Observer should be present on board the dredger during the first and second year of extraction, with results reviewed and reported at least four weeks before phase 2 and 3 of dredging respectively, to inform whether the exclusion zones are sufficient to prevent disturbance of seals.

Reason

The Marine Mammal Observer will be able to record signs of disturbance such as seals rushing into the water, moving away from the dredger and to other parts of the sands and to observe the behaviour of mothers and pups. The results can then be used to alter operating conditions, if required, as part of the adaptive management approach.

9) Section 11 Ornithology

We agree with the bird species and sites that have been scoped into the EIA and agree that the correct impacts and pressures have been assessed. There will be no impacts to protected bird populations.

10) Section 17 Cumulative Impact Assessment

The cumulative impact assessment only considers plans or project within the planning system i.e. the local authority or MMO public register when it assess cumulative impacts to environmental receptors. It does not consider how pressures induced by dredging could combine with those of commercial fishing, we feel this is an oversight and in our opinion fishing should be included in the assessment. Fishing should not be considered part of the environmental baseline and if a habitat/area of seabed is experiencing stress as a result of fishing then the cumulative impact assessment should consider if and how the project could exacerbate or worsen those levels of stress.

We acknowledge that there is very little fishing activity taking place in the dredge area, as evidenced by the data presented in the ES. As a result, the risk for further impacts to occur through the interaction of fishing and dredging is small. However, to ensure robustness the cumulative impact assessment should consider how dredging will interact with impacts from commercial fishing.

PART 2: Goodwin Sands Recommended Marine Conservation Zone (rMCZ)

Natural England agrees that the ES has identified all of the designated sites which may, or may not, be impacted by the application.

The proposed aggregate dredging, as set out in the information provided, is within the Goodwin Sands recommended Marine Conservation Zone (MCZ) due for consideration as part of Tranche 3 of the marine conservation zone designation programme. This site has been identified as being of national importance due to the presence of:

- Moderate energy infralittoral rock
- Moderate energy circalittoral rock
- Subtidal coarse sediment
- Subtidal sand
- Blue mussel beds
- Rossworm reef (*Sabellaria spinulosa*)
- Eastern English Channel outburst flood features

We can confirm that the timetable for consultation on Tranche 3 sites has not changed and that the Goodwin Sands recommended MCZ is still not a designated site nor is it currently subject to public consultation.

Current Government policy stipulates that recommended MCZs prior to public consultation are not a legal consideration within the marine licensing process and thus are not subject to assessment under section 126 of the Marine and Coastal Access Act (2009). In addition the site does not yet have any conservation objectives upon which to base an MCZ assessment.

Goodwin Sands rMCZ – effect on future designation

It is important that the MMO have an appreciation of the potential risk the application could pose to features of the rMCZ and their conservation objectives if designated in the future. In the section below we have outlined the level of risk we feel the activity poses to the long term condition of the recommended MCZ.

The only feature that is likely to be significantly affected by direct and indirect pressures is likely to be the broad scale habitat **Subtidal sand.**

Whilst the site doesn't yet have a formal conservation advice package we can identify the generic properties which are important to maintaining the condition of subtidal sand. These properties are outlined below and we have provided our views on the potential risk the activity poses to them.

Feature extent

The application proposes to remove sand directly from an area which represents the rMCZ feature 'Subtidal sand'. We do not however feel the activity will result in a loss in spatial extent i.e. the area, of the Subtidal sand feature present in the site or within the MCZ network.[4] This opinion is based on 2 factors:

1) The marine license will have a condition which restricts the depth of sand that can be removed and ensures that at least 0.5m of the surface sediment layer remains after dredging, allowing recovery of the existing faunal assemblage (although we are recommending that this be increased to 1m – see section 1.2 of this letter). For example, the surface sediment layer of fine sand (which represents the Subtidal sand rMCZ feature) is a homogenous deposit overlaying cretaceous chalk. If dredging was to expose the lower layer of chalk the seabed would no longer support the same benthic and epi-benthic species that existed prior to the commencement of dredging (and would not represent Subtidal sand feature). By retaining a depth of at least <1m of sediment the area will still function and represent Subtidal sand habitat.
2) DHB have committed to using the 'limits of acceptable change' monitoring methodology recently developed and employed by the wider marine aggregate industry for ensuring seabed conditions remain suitable for faunal recolonization thus ensuring the dredge site continues to function and represent Subtidal and habitat (see section 1.1 of this letter).

Sediment composition and distribution

We do not predict there to be any change in the sediment type or distribution of sediment types in the MCZ. Due to the following reasons:

- A license condition will be employed which prevents the exposure of the underlying rock/substratum at the seabed surface (see section above).
- The local hydrodynamics will not be altered to a point where changes in deposition/erosion rates could cause alterations in sediment type
- There will be no overboard screening of cargo/aggregate (such activities have been observed to increase levels of fine sediment on the seabed at other sites)
- Deposition of sand from the plume will not cause any significant substrate change due to the fact that the sand falling out of suspension will be similar in grade to the sand on the seabed (in the plume footprint).
- There will be a license condition preventing changes in seabed type and a monitoring plan in place to observe any changes and put in place adaptive management.

Species composition of component communities

Biogenic reef and rock habitats

The proposed license area is within the Goodwin Sands recommended MCZ. Survey work to support this designation has indicated the presence of *Sabellaria spinulosa*, blue mussel beds (*Mytilus edulis*) and exposed chalk outcrops. These features are of high conservation value and would be highly sensitive to dredging. The EIA characterisation survey indicates that **none of these features are present within the license area and we have high confidence that this conclusion is correct.**

Subtidal sand

The proposed license area is almost wholly characterised by Subtidal sands, represented by the EUNIS level 4 biotope A5.23 'Infralittoral fine sand' dominated by the EUNIS Level 5 biotope A5.231

[4] Unlike for Annex I sandbank features, topography and volume is not an attribute of the MCZ interest feature Subtidal sands.

'Infralittoral mobile clean sand with sparse fauna'. Multivariate analysis identified the extraction area to be characterised by 3 faunal groups

- *Group A was dominated by Nephtys cirrosa* and the amphipod *Pontocrates altamarinus* both characteristic of mobile sandy habitats.
- *Group B was dominated by Gastrosaccus spinifer* and the amphipod *Urothoe brevicornis*, both indicative of mobile sandy habitats
- Group G which was largely devoid of fauna

The 3 faunal groups are characteristic and well represented in the mobile sand covering most of the south Caliper bank. Areas outside the extraction area (off the bank) display higher species diversity and abundance as the sediment composition changes and natural disturbance levels drop.

The EIA concludes that full recovery of the fauna within the license area will take place within several years of the cessation of dredging. The EIA references Hiscock et al 1999 and Cooper et al 2008 which indicate the broad habitat and species type found in the dredge site will show recovery within 5 years. The prediction that full faunal recovery will take place within 5 years is based on the following principles

- Sensitivity information from MARLIN[5] shows that the species recorded in the site have a 'high' recoverability to physical disturbance.
- The biotopes are characterised by species adapted to high energy, naturally disturbed environments
- The characterising species are present in areas adjacent to the extraction area and will be available to support recolonization
- Changes in faunal community are observed to correlate most strongly with variations in grain size. DHB have committed to a monitoring and adaptive management plan which is designed to ensure that grain size within the license area remains within defined limits set by the pre dredge baseline.

Natural England agrees with the findings of the infaunal survey and multivariate analysis in that the Faunal Groups identified within the dredge area are "*characteristic of mobile sandy habitats and, therefore, are relatively robust with high potential to recover following disturbance*".

Sediment movement and hydrodynamic regime

The Goodwin Sands is a highly dynamic site, influenced considerably by wave and tidal processes. Dredging within the proposed license area will lower the seabed to an extent where it alters tidal flow and the movement of waves both in and outside of the license area. Significant changes in the movement of water could alter the physical and ecological processes of the Goodwin Sands. The DHB have contracted HR Wallingford to undertake a modelling study (presented as part of the ES and appendices) to examine the effects of seabed deepening on the physical process in and around the extraction area and the wider Goodwin Sands complex.

This study of physical processes examines 4 aspects of hydrodynamics which could affect the condition of the subtidal sand feature

- **Wave conditions:**

The SWAN wave modelling study used extreme wind conditions of a 1 in 200 year scenario to examine effects on very large waves as these will present the biggest relative change. The modelling indicates very little change in wave height as a result of the proposed dredging. The worst case scenario is that changes in wave height of <0.1m are possible when wind originates from 30^0 90^0 120^0, changes of up to 0.2m could be possible when it originates from 240^0.

[5] The Marine Life Information Network (www.marlin.ac.uk) provides information about the biology and sensitivity of marine habitats, communities and species around Britain and Ireland

Seabed levels change significantly in the study area naturally thus to understand the environmental impact wave changes could have on the sandbank it is important to understand what level of variability would be expected in the area without dredging. Consequently, HR Wallingford examined the level of change in wave conditions that have occurred between the present day - 2006 and 1995-98. This study indicated that the largely natural seabed changes observed between the present day and 2006 will have caused considerable changes in wave height across the Goodwin Sands with large areas expected to have experienced changes of >0.5m in wave height (1in 200 year scenario).

- **Tidal Flow:**

A TELEMAC-2D flow modelling study examined changes in the velocity of water moving through and around the extraction area as a result of dredging. The modelling showed changes to be largely concentrated within 1km of the extraction area i.e. all of the current speed differences in excess of 0.05 m/s have been found to be within about 1 km from the proposed dredging area. Increases and decreases up 5-10% potentially occur within 1km of the extraction area, which in absolute terms could be up 0.2m/s in a small part of the extraction area (PIZ) and 0.05 – 0.1m/s in some areas immediately outside the license area. Hence no widespread effect on tidal currents due to the proposed dredging is anticipated.

- **Sediment movement and bank morphology:**

Changes in tidal flow and wave conditions can affect the way sediment is transported around the sandbank and can cause increased erosion or deposition in and around the license area. These changes, if significant could cause a change in seabed morphology and alter the level of disturbance or shelter experienced at the seabed. To address this risk HR Wallingford modelled the likely change in erosion, deposition and sediment transport likely to be induced by dredging.

The modelling suggested only small changes in the residual sediment transport and erosion/deposition pattern. These changes are all close to the proposed dredging area and in most locations are evidenced by a reduction in predicted potential erosion rate within the dredging area. For example the residual transport rates will reduce, indicating that the system will compensate the deepening by depositing more/eroding less within the proposed dredge area. There will be a reduction of potential deposition rate in the deeper channel areas next to the dredging area.

HR Wallingford predict that there will be no impact on the sediment transport processes which control the naturally changing form of the South Goodwin Sands, including the intertidal areas of the sandbanks. They also conclude that there are no significant deviations of sediment transport vectors from the baseline directions and hence the pattern of sediment circulation is not affected by the dredging.

- **Conclusion regarding effects on Sediment movement and hydrodynamic regime**

In conclusion, the hydrodynamic modelling study based on a seabed lowering of up to 1.12 (scenario 1) and 1.95 (scenario 2) does not indicate that wave conditions, tidal flow velocities or sediment transport characteristics of the Goodwin Sands will be altered to a level where they cause significant changes in the ecological or physical functioning of the Goodwin Sands.

Energy / exposure

Faunal assemblages and seabed conditions can be altered by changes in the level of physical disturbance and mobility of surface sediments. Such changes could be caused by changes in wave and tidal energy. Whilst the seabed lowering associated with dredging will result in some changes in wave and tidal flow (at least temporarily), these changes are relatively small (as mentioned above).

The sensitivity of a site to changes in energy/exposure levels is dependent upon existing levels of disturbance i.e. organisms dependent on sheltered low energy areas could will have a low tolerance to increasing wave action. The dredge area experiences high levels of natural disturbance, which is indicated by 3 sources

- the hydrodynamic modelling of baseline conditions,
- the presence of significant sediment bedforms (rippling) in the multibeam data
- the presence of biotopes associated with mobile sand.

Considering the high levels of natural disturbance experienced in the impact area naturally the small changes in energy levels predicted are unlikely to result in significant effects to the fauna and character of the seabed.

Water quality - turbidity

Sediment dispersion:

A dispersion modelling study was undertaken using the TASS hopper model to understand what effect the sediment plume created by the dredger would have on the surrounding environment. It concluded that the 10 mg/l footprint contour extends 1.5-2 km from the dredging area to the north The 20 mg/l footprint is similar and extends 1-1.3 km from the dredging area to the north and east. The 50 mg/l footprint extends less than 500 m from the dredging area. Within the region, suspended sediment concentrations typically vary between 10 and 50 mg/l and, during storms; suspended sediment concentrations of up to 200 mg/l have been measured. This level of temporary increase relative to the high naturally occurring suspended sediment levels is not considered significant, especially when considering low sensitivity of biotopes in the plume footprint.

Deposition of sand from the plume will occur within the plume footprint and will not cause any significant substrate change due to the similarity of the sediment.

Concluding comments regarding the rMCZ

The EIA concludes that any impact on the features of the rMCZ, as a result of the dredging application, will be relatively small and temporary in nature with full recovery expected within 5 years of the cessation of dredging. We agree with this conclusion and do not feel that the activity is likely to permanently impact the features of the rMCZ so that the site could not be proposed for designation in the future, providing our recommended conditions (listed in full in *Annex 2*) are included in the license.

Yours sincerely,

Cooper (2012). Setting limits for acceptable change in sediment particle size composition following marine aggregate dredging. The Centre for Environment, Fisheries & Aquaculture Science, Marine Pollution Bulletin 64 (2012) 1667–1677.

Annex 1 Summary of recommended changes to the Environmental Statement

1. A monitoring plan presented prior to consent.
2. A written commitment to using the 'limits of acceptable change" monitoring methodology by Cooper (2012).
3. The argument as to why alternative sources of aggregate aren't being used is not well formed.
4. Further discussion is required on what morphological changes could result from the removal of 2.5 million m3 from the 'closed' sediment system of Goodwin Sands.
5. The ES must map where areas of circa littoral coarse sediment are in relation to the extraction area. Dredging this seabed type should be avoided.
6. Further discussion on potential mitigation measures in order to avoid seal pupping and moulting seasons.
7. The cumulative impact assessment should take into account fishing pressures.

Annex 2 **Summary of recommended license conditions**

Section	Condition	Reason
Best Practice and Mitigation Measures	The license holder must ensure that upon cessation of dredging the sediment substrate must be of a similar grade to the conditions that existed before dredging commenced with due allowance being made for natural sediment movements. A specification as to how this will be demonstrated must be agreed in writing with the MMO prior to any surveys or dredging taking place.	To allow re-colonisation of the seabed upon cessation of dredging activity.
	In line with standard practice and prior to the commencement of dredging, develop a robust monitoring plan that uses the 'limits of acceptable change' methodology, which is undertaken throughout the lifetime of the project and feeds into an overall adaptive management plan.	To ensure that any potential impacts from the dredging activity remain within agreed acceptable levels.
	After each phase of monitoring, there should be a substantive review period.	To ensure that best practice is being followed and that any required operational changes are made.
	Increase the sediment capping layer from 0.5m to 1m.	In order to mitigate for potential unforeseen natural sediment changes which may reduce the sediment layer to less than 0.5m and therefore have an impact on the function of the subtidal sand habitat
Coastal Processes and Hydrodynamics	No dredging should occur below the levels used in the modelling study scenarios. This should be verified as part of the monitoring and enforcement process.	If dredging occurs below these levels (1.12m and 1.95m) then the conclusions of the EIA will be invalidated.
Benthic Ecology	Exclude dredging from areas of circalittoral coarse sediment.	In order to reduce potential impacts to the circalittoral coarse sediment biotope (EUNIS A5.14) which has a higher sensitivity than the subtidal sand biotopes which dominate the dredging area.
Marine Mammals	Vessel transit routes should be chosen to avoid known harbour and grey seal haulout sites and a consistent route to and from the dredging site should be used as far as practical.	So that seals are not disturbed unnecessarily during their important life stages.
	The dredging exclusion zone around known seal haulout sites	This will ensure life stages that may not be apparent to an

	should be 1km at all times, including during sensitive life stages.	observer (e.g. pregnant seal or just weaned pup) where animals are more vulnerable to disturbance are also protected.
	A Marine Mammal Observer should be present on board the dredger during the first and second year of extraction, with results reviewed and reported at least four weeks before phase 2 and 3 of dredging respectively, to inform whether the exclusion zones are sufficient to prevent disturbance of seals.	The Marine Mammal Observer will be able to record signs of disturbance such as seals rushing into the water, moving away from the dredger and to other parts of the sands and to observe the behaviour of mothers and pups. The results can then be used to alter operating conditions, if required, as part of the adaptive management approach.