



Goodwin Sands Aggregate Dredging Marine Licence Application

Responses to MMO December 2016 Public
Representations

MLA/2016/00227

Author: Dover Harbour Board

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Status: Final

Dredging is not in accordance with the Dover Strait Implementation Plan developed through European Straits Initiative and the Network of STRAits (NOSTRA) project.

The *Dover Strait Implementation Plan* seeks to conserve and enhance the natural environment, to ensure that the area will continue to be valued as a place to live, work and relax. However, the plan explicitly recognises the DWDR project as being beneficial to its aims: "*as part of Dover Harbour Board's Dover Western Docks Revival project, there are plans for a major waterfront transformation that will provide a fantastic destination and offering for tourists.*" The extent of the benefits provided to the Dover waterfront will be partially dependant on the aggregates source used. The planned waterfront enhancements in the DWDR scheme have been designed assuming availability of a particular budget. In the event that material needs to be sourced from further away than Goodwin Sands, higher costs associated with this element of the project would result in less funding being available to deliver the waterfront redevelopment.

The Dover Strait Implementation Plan is not a legally binding document, and makes no explicit mention of dredging or the Goodwin Sands site.

The increased CO₂ emissions from obtaining material from other aggregate sites is not relevant given that the Dover Western Docks Development will lead to an increase in shipping and therefore more CO₂ emissions.

While it is correct to state that increased shipping due to the DWDR project may increase local CO₂ emissions, large cargo vessels that previously utilised more distant ports will now have the option of stopping at Dover, representing a net CO₂ saving per ship through reduced sea miles travelled. In addition, the Port of Dover is committed to reducing its carbon footprint year on year, and will continue to strive toward decreased carbon emissions in light of increasing cargo trade. Some elements of the DWDR are expected to provide a carbon saving compared to existing, inefficient cargo operations carried out at the Port of Dover. This design consideration is evidenced in the *Dover Development Plan Terminal 2 Environmental Statement*. One measure required to deliver this low-carbon development is use of local aggregates in the construction of the DWDR development. Therefore, an application is being made to extract aggregate from the Goodwin Sands rather than using emissions-intensive aggregate from further afield.

Funds have not been allocated for the recovery, restoration and preservation of archaeological remains as required for the UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001 and the Valletta Treaty.

The UK is not a ratified party to the *UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001*. Despite not ratifying the convention, the UK has adopted the Annex to the Convention as best practice. However, the 36 rules contained within the Annex are not targeted at development schemes, and only come into force when directing activities toward heritage assets (i.e. carrying out an investigation or excavation). Any exploratory activities would be carried out in concordance with a Written Scheme of Investigation, which is the accepted approach in the UK for agreeing archaeological strategy. A draft Written Scheme of Investigation has been prepared for the proposed Goodwin Sands dredging.

Meanwhile, the Valletta Convention 1992 provides state-level aims for protecting heritage. The Valletta treaty states: *the actor, either public or private, who is responsible for the concerning development project, has the obligation to allocate funding of any necessary related archaeological activities, such as rescue excavations (Art. 6, para. ii). This means that public or private development plans should provide funds in the budget for archaeological survey work and full recording and publication of the findings in the same way that provision is made for environmental impact studies (Art. 6, para. ii b).* Following the appointment of an archaeological contractor to the project, an *Archaeological Protocol* will be established, containing detailed guidance on management of the discovery of any remains. Implementation of this protocol will ensure that any finds are dealt with in the appropriate manor.

Historic England, the government’s statutory advisor on the historic environment, has been active and engaged during discussions on archaeological matters, and are supportive of the protocols put in place.

Additionally, the budgeted risk register for the DWDR project has allocated risk to the unexpected discovery of archaeologically significant material.

The professional engineering specification of the quality of the aggregate required should be provided.

Due to local historical use of sand sourced from the Goodwin Sands, substantial information is available on the grading and engineering properties of the material. This knowledge has enabled a robustly engineered solution to be reached for the DWDR project, whereby rapid and accurate compaction can be achieved through use of Goodwin Sands material. This compaction speed enables the earliest operational use of the reclaimed area for its proposed purpose of carrying heavy containers and container-handling plant loads. The specification of fill material for the reclamation works within the DWDR Project is included in the below table, and for the reasons stated above is in line with material available from Goodwin Sands.

Material Type	General Material Description	Typical Use	Property	Test	Lower Limit	Upper Limit	Compaction Requirements
Alternative Granular Fill Material	Fine to medium sand or gravelly sand	Bulk fill for reclamation areas in Berths A, C, Marina Curve, Marina Curve Extension and PoWP berth pocket retaining wall	(i) Grading	ADSTM D422 BS1377: Part 2	Less than 5% Passing 0.06 mm	125 mm	Rapid Impact Compaction at +3.8 mCD and at 500 mm below reclamation levels as given in Table 302/1. See Table A2.
			(ii) Plasticity index	-	Non-plastic	Non-plastic	Compaction of final 500 mm layer to provide an end product 98% of maximum dry density of BS 1377: Part 4 (4.5 kg rammer method).
			(iii) Maximum Dry Density (4.5 kg heavy proctor test)	BS1377: Part 4 or ASTMD1577	18.0 kN/m ³	-	
			(iv) Phi (Peak angle of shearing resistance)	BS1377: Part 7 clause 4 or Part 8 clause 4	34°	-	

Although it is recognised that material of similar engineering properties sourced from alternative sites could be suitable for use in the DWDR project, it must be observed that existing licenced dredge sites considered as alternatives to the Goodwin Sands have been selected by aggregate producers for their high quality construction aggregates. To utilise aggregate from these existing licenced sites as bulk fill in the DWDR project would represent an inefficient use of construction quality aggregate.

Clarification should be provided as to whether material will be landed at other Kent ports then transported by road to Dover.

Section 2.5 of the *Goodwin Sands Aggregate Dredging Environmental Statement* explicitly states the following:

"Once the hopper is loaded, the dredger will transit under its own power to the DWDR construction site in the Port's Western Docks where it will moor and discharge the aggregate into the reclamation area. The discharge of the aggregate was described and assessed under the T2 EIA and for the Marine Licence application for the DWDR scheme, and was consented through the Dover Harbour Revision Order 2012 and the Marine Licence for the DWDR scheme (Licence number L/2016/00056/1)."

This statement provides clarification that no material will be landed at other Kent ports and transported to Dover.

The Goodwin Sands are a closed system so the removal of sand from one part will lead to a loss elsewhere.

It is accepted that the proposed dredging will modify the local morphology of the dredge area, specifically through lowering of the seabed level. However, it should be noted that the maximum volume of sand to be extracted during

the proposed dredging is less than 0.3% of the total material present within the Goodwin Sands system. Modelling undertaken to inform the Environmental Statement demonstrates the limited magnitude and spatial extent of any effects that the locally deepened seabed level may have on tidal flows and waves, which are the driving forces of sandbank morphology. The ES also identified limited effects on sand transport and patterns of morphological change as a result of the proposed dredging.

Furthermore, a study undertaken by HR Wallingford, "*Goodwin Sands: Study of Historical Changes (Technical Note DDM6067/TN01)*", demonstrated that the morphology of the South Goodwin Sands changes naturally over time. The results of the HR Wallingford study are further supported by Figure 4 of the Wessex Archaeology Report "*Goodwin Sands: Archaeological Review of Geophysical Data (2017)*" which examines morphological changes in the proposed dredge area between 2015 and 2017. Even over this relatively short period of time, significant changes in seabed levels and sandbanks were recorded of up to 10m. These results indicate the significant natural morphological changes that occur within the Goodwin Sands over short timescales.

In light of the minor impacts to physical processes of the proposed dredge works, and the very large natural variation in the Goodwin Sands, it can be concluded that any net losses to the system will be insignificant.

The works will impact on otters using Ramsgate as breeding and resting grounds.

The proposed dredge area is approximately 12km south-east of Ramsgate and the vessels moving to and from the dredge area will be doing so to the south of the proposed dredge area. Coastal otters can hunt as far as 100m offshore in water over 10m deep, but most feeding is done close to the shore in water less than 3m deep (CCW, 2009). In addition, the Environment Agency's *Fifth Otter Survey of England 2009-2010* showed no positive sightings of otters in the "TR" region which includes the Goodwin Sands and surrounding areas since the year 2000 (including Ramsgate).

It is therefore considered highly unlikely that the otters using Ramsgate as breeding and resting areas will be affected by the proposed dredge.

The in-combination impacts with previous dredging since the 1970s has not been considered.

The HR Wallingford study "*Goodwin Sands: Study of Historical Changes (Technical Note DDM6067/TN01)*", analysed the recent changes in the bathymetry of the South Goodwin Sands, taking into account historic datasets from the 1980s. Calculation of sediment volume changes was conducted in order to assess the development of the bank over time. Despite the dredging activity previously carried out in the Goodwin Sands, the analysis determined that although the morphology of the system changed with time, the volume of sediment remained at, or near to, a constant amount. This analysis suggests that in-combination impacts with previous dredging since the 1970s will not occur, due to the regenerative nature of the Goodwin Sands coupled with the long passage of time between dredging operations.

Clarification as to why the dredging of Varne bank was not considered instead of Goodwin Sands.

Varne Bank is not an established dredge site, unlike Goodwin Sands which has previously been dredged. Additionally, the Varne Bank lies within the Dover Strait, and is therefore an operationally difficult location within which to carry out dredging activity.

No night fisheries data was supplied and other data from 1995 is out of date.

The scope and design of the ecological surveys conducted for the *Goodwin Sands Aggregate Dredging Environmental Statement* were agreed in advance with the MMO through the *EIA Scoping Report and Terms of Reference for the Benthic and Epibenthic Characterisation*. The major concern surrounding night-time fisheries is the use of the Goodwin Sands by sandeel populations. Liaison with the MMO and Natural England took place specifically in relation to sandeel surveys and it was agreed that night-time surveys were not feasible due to safety concerns. This opinion has been

corroborated by Cefas, who responded to the Environmental Statement with the opinion that a night-time survey for sandeel is not feasible, and the habitat-based approach and data collected from epibenthic trawls can be used to provide a sand eel assessment.

We accept that the 1995 data referred to may have limitations. However, the Environmental Impact Assessment has recognised these limitations and consequently applied a medium sensitivity to sandeel populations to account for this. Section 5 of the Further Environmental Information Report submitted to the MMO in September 2016 contains extensive detail on the measures to be employed for avoidance of disturbance of sandeels.

The dredging will interrupt the flow of fish such as herring towards the North Sea.

Section 9.5 of the *Goodwin Sands Aggregate Dredging Environmental Statement* addresses impacts to fish species (including herring) from the proposed dredging activities. Research presented within the Environmental Statement demonstrated that only herring are likely to use the area for high intensity nursery grounds. Due to the vast majority of inshore waters having been identified as having high potential for nursery grounds, the scheme is unlikely to adversely affect nursery stocks leading to a notable reduction in stocks in areas such as the North Sea.

Additionally, the magnitude of the suspended sediment concentration changes associated with the proposed scheme will be well within the extreme conditions for the area, and therefore will present only moderate impacts within the 50mg/l sediment footprints, minor within the 20mg/l and 10mg/l footprints, and negligible beyond the area of the footprints. Due to the predicted low receptor sensitivity (for herring only) and the minor and negligible magnitude of suspended sediment increases beyond the vicinity of the dredger, the changes in water quality (which will be temporary) are predicted to result in an impact of negligible significance to fish and fish larvae. Furthermore, during dredger operational periods, fish are not physically constrained and they would therefore be able to evade the source of the noise and return once dredging activity has ceased. Therefore, the impact is considered temporary and of low magnitude. This assessment demonstrates that the impacts to fish species such as herring will be sufficiently low to avoid interrupting the flow of fish towards the North Sea.

It is incorrect to suggest that sandeels are not abundant on Goodwin Sands.

The statement that the area of the Goodwin Sands is not characterised by high sandeel abundance was based on the results of grab samples collected for faunal analysis. Of 50 collected samples, only 2 returned positive results for sandeel. Despite these low results, sandeel are extensively assessed in Section 9 of the *Goodwin Sands Aggregate Dredging Environmental Statement*.

Section 9.5.2 of the ES, states that sandeel are likely to be present within the proposed dredge area and will overwinter within the sediment. Sandeel are known for high site fidelity and are likely to spawn from December through February. Only the first of the proposed dredging periods overlap with this spawning period. In accordance with established practice, a minimum 1 m layer of sediment will be left in place to facilitate re-colonisation and recovery of benthic communities (including sandeel). Recovery and recolonisation by sandeel typically occurs quickly, and therefore the sensitivity of the habitat is considered to be low. The habitat within the proposed dredge area is not considered to be prime sandeel habitat, and there are large areas of more suitable sandeel habitat available within the wider region. Additionally, the retention of the capping layer of sediment leads to consideration of any impacts as temporary. Therefore, the magnitude of the impact is considered to be low.

Observations 7.2 and 7.3 by the MMO in correspondence dated 20 December 2016 state that the MMO concurs with the overall assessment for sandeel species as being of medium significance, and that the potential risk to spawning sandeel during the spawning season is reduced to within acceptable limits.

The works will impact on seabirds and migratory birds that frequent the sands.

Observation 8.1 within the correspondence titled: *MMO Response to Goodwin Sands Further Information Request (20/12/16)*, states the following:

"The proposed dredging is unlikely to significantly impact the foraging of bird species, as there are other areas of suitable habitat within close vicinity, which will support sandeel populations and their prey."

This observation was provided by the MMO and its group of technical advisors, including: Cefas, Natural England, Historic England, the Maritime and Coastguard Agency and Trinity House (among others). This correspondence demonstrates that this competent group of technical advisory bodies are content that the proposed dredging works on the Goodwin Sands will have negligible impacts to the birds that frequent the area.

In addition to the opinion of the MMO and its advisors, Section 11 of the *Goodwin Sands Aggregate Dredging Environmental Statement* further clarifies that impacts (including within-project cumulative impacts) to seabirds will be of negligible significance. Therefore, no mitigation is suggested for ornithology beyond that built into the project design.

The importance of Goodwin Sands as an important foraging area and rest area for both harbour seal and grey seals has not been sufficiently explored.

Section 10 of the *Goodwin Sands Aggregate Dredging Environmental Statement* assesses the importance of the Goodwin Sands as a foraging and rest area for both harbour seals and grey seals. A range of data sources were utilised in this assessment to gain an understanding of the baseline environment of the Goodwin Sands for seal populations.

The assessment of the potential impacts of any reduction in prey availability for seals was based on the detailed assessment of impacts on fish species in Section 9 of the ES and taking into account the diet and likely prey species in the area. The assessment determined that, despite the high value of the marine mammal receptors, their low sensitivity to a limited reduction in prey availability and the low magnitude of prey loss due to dredging means that the significance of the impact of marine mammals would be minor adverse (not significant).

Detailed modelling was undertaken to assess any potential changes or loss of intertidal areas where seals could haul-out. This assessment determined that there would be zero to negligible magnitude of effect on the intertidal areas at Goodwin Sands and, therefore, the overall significance of the potential loss of or change to haul-out sites at Goodwin Sands was assessed to be negligible.

The assessment of the potential disturbance to harbour seals and grey seals on haul-out sites at Goodwin Sands took into account the areas of sand that could be exposed and used as haul-out sites, as well as the currently available information on haul-out site locations (ZSL survey data). The assessment determined any potential impact to be minor adverse (not significant), based on the reaction of seals to vessel and location of the seal haul-out site in relation to the proposed dredge area. This assessment included the potential disturbance on harbour seals during the breeding season and moulting period.

Although the assessed impacts were concluded to be minor adverse or negligible, a precautionary approach to mitigation is proposed in recognition of the marine mammals' high receptor value.

The planned mitigation measures include:

- Dredging vessels avoiding exposed sandbanks and intertidal areas where seals could haul-out sites at Goodwin Sands by maintaining a minimum distance of 1km between the dredgers and the exposed sandbanks.

- During sensitive times of the year for the harbour seal breeding season (June to July) and for the harbour seal moult period (August) the dredger(s) would avoid seal haul-out sites at Goodwin Sands by maintaining a minimum distance of 1.5km between the dredger(s) and the exposed sand banks.
- Marine Mammal Observers (as identified in Section 10.6.1 of the ES) would also observe any reaction or disturbance of seals at haul-out sites, including the type of reaction, number of animals and distance from the vessel. These observations will help to determine if the proposed minimum distance between the dredgers and haul-out sites is adequate. The observations would also provide valuable information on the reactions of seals to dredging vessels and dredging activities.

The evidence presented above demonstrates that the importance of the Goodwin Sands as a foraging and resting area for harbour and grey seals has been assessed during EIA, and appropriate mitigation measures have been recommended where necessary. Therefore, any impacts to the foraging and resting habits of seals using the Goodwin Sands are expected to be negligible.

The Zoological Society of London's (ZSL) grey seal breeding survey (completed in December 2014) has been misinterpreted in the ES. No transects were completed over the outer estuary sand banks, so it is incorrect to say 'grey seals were not present on coastal sand banks, including Goodwin sands'.

The *Goodwin Sands Aggregate Dredging Environmental Statement* acknowledged that "the results of the ZSL surveys indicate that Goodwin Sands is an important haul-out site for grey seals in the region (Barker, 2015; Barker and Obregon, 2015)" and that "grey seals and grey seal pups were not present on coastal sand banks, including Goodwin Sands, during the peak grey seal breeding season (December) in the Greater Thames Estuary (Barker, 2015)." The assessments took into account that grey seals could be present on exposed sand banks at any time of the year, but were not hauled-out during the survey periods.

The proposed exclusion zones for known haul out sites do not include the haul out site at Trinity Bay (2 harbour seals were identified on the sand bank during the ZSL aerial survey on 7 August 2013).

The proposed exclusion zones of 1km include the exposed sand banks and the intertidal areas along the proposed vessel route from the dredge site to Dover Harbour

The only seal haul-out site not included in the exclusion zone is a small intertidal area to the east of the proposed dredge zone (see Figure 7.1 of the Further Environmental Information provided to the MMO dated 23/09/2016). This site is infrequently exposed by the tide (evidenced in Figure 10.10 of the *Goodwin Sands Aggregate Dredging Environmental Statement*), and is not frequently used by seals as a haul-out site (evidenced in Figures 10.7 and 10.9 of the ES, which demonstrates that seals were only recorded at the site once during four ZSL visits). Due to the small size of this area, in addition to its infrequent exposure, it is unlikely that harbour seals would use this site during breeding or moulting. Therefore, we do not feel that this site needs to be included within the proposed temporary exclusion zone. This has been accepted by the MMO.

The seal exclusion zone should be kept relative to the low tide sand exposure at all times to increase the likelihood that seals become habituated to the dredging and related vessel activity.

The exclusion zones are based on exposed sand banks and exposed intertidal areas at low tide that seals could use as haul-out sites, with the exception of the small infrequently exposed site as outlined in response #16 above, as well as the currently available information on known haul-out site locations (ZSL survey data). The MMO has confirmed that they are satisfied with the proposed exclusion zones for seal haul out sites during sensitive times of the year.

Additionally, DHB has previously confirmed within the Environmental Statement that a pre-dredge bathymetry survey will be undertaken to identify any changes to local bathymetry. Additional exclusion zones will be established around

any newly identified intertidal areas within the proposed dredge area. This is necessary for both operational reasons (to prevent the dredger grounding), and ecological reasons (to ensure avoidance of haul out sites).

Will seaweed on the east Kent coast be impacted by turbulence caused by dredging?

Section 6.6.3 of the *Goodwin Sands Aggregate Dredging Environmental Statement* examined the impacts of the proposed dredging activities on wave regimes in the vicinity of the Goodwin Sands. The Environmental Statement found the following:

The results show that the predicted maximum change in wave height is between 0.02m and 0.1m for both scenarios for all water levels along with waves approaching from 30°, 90° and 120°. The maximum excursion of this change is 3.5km (Scenario 2, 30° waves, MLWS), but in most cases is less than 2.2km. In no instances does the change in wave height exceed 0.1m. Also, the change in wave heights is always greater than 4.5km from the coastline beyond which (e.g. closer to and at the coast) there is no change (HR Wallingford, 2015e).

Section 6.6.4 of the Environmental Statement examined impacts on the tidal regime of the area:

The predicted magnitudes of change in tidal current velocities are so small that they are unlikely to affect the form of recent (i.e. Holocene) sediments over and above the natural tidal processes and are considered negligible. Typically, sand waves and megaripples form on the sea bed beneath tidal currents with velocities of around 0.5-0.8ms⁻¹. The predicted changes in tidal current velocities caused by the proposed dredge are unlikely to effect the continued formation and maintenance of these bedforms. Also, the change in tidal current velocities is always greater than 5km from the coastline beyond which (i.e. closer to the coast) there is no change (HR Wallingford, 2015e).

Furthermore, Section 6.5.9 of the Environmental Statement considered the possibility of increased turbulence as a result of the proposed dredging activity, and concluded that:

"The potential concentration of suspended sediment that is released into the water column during the dredging process could potentially double the baseline conditions but is distributed locally (i.e. generally within the confines of the Goodwin Sands) and within the concentrations generated by natural events. The increase is therefore considered to be negligible."

These results demonstrate that no changes to the wave or tidal regime will be experienced within 4.5km and 5km of the east Kent coast respectively, and turbulence will fall within the limits of natural events. Therefore, macroscopic algae populations on the east Kent coast are not anticipated to be affected by the proposed dredging activity.

There is a conflict of interest with the Head of Minerals and Infrastructure at The Crown Estate also being a trustee of Wessex Archaeology.

Under company law, directors have a legal duty to avoid conflicts of interest and, as a company limited by guarantee, this applies to the trustees of Wessex Archaeology who are listed as officers at Companies House.

Under the Crown Estate's code of business ethics employees must avoid conflicts of interest between their private activities and their responsibilities in the conduct of Crown Estate business and potential conflicts must be declared and resolved.

This is a governance issue to be managed by the relevant individual and his respective organisation and is not relevant to the determination of this application.

The depth of the geophysical survey should be confirmed.

The report, *Archaeological Review of Geophysical Data (Wessex Archaeology)*, attached as Appendix 14.2 to the *Goodwin Sands Aggregate Dredging Environmental Statement*, provides the specification of all equipment utilised during the geophysical survey. The specification for the sub-bottom profiler is as follows:

The SBP data were acquired using a Knudsen Chirp 3260 system on a Neptune Transducer (pole mounted) array, and a C-Products C-Boom low-voltage Boomer with CPhone 8-element hydrophone. The data were digitally recorded using Knudsen's Sounder Suite (Chirp) and C-Product's C-View SDMP software, and provided to WA as navigation corrected .sgy files. Only the boomer data were used for the archaeological assessment, as the boomer data provided greater penetration into the sediments than the chirp data.

The depth range of sub-bottom profilers varies between equipment and according to environmental conditions such as the nature of the strata and water conditions. Consequently, it is difficult to give an accurate indication of the depth of the geophysical survey. It should also be noted that the palaeochannel, which is the most significant geophysical structure within the proposed dredge area, is cut into the chalk seabed, over which a minimum capping layer of sediment will be retained, and therefore will not be impacted by the proposed dredging activity.

In June 2017, further exploratory surveys of the Goodwin Sands were undertaken, including magnetometer, sub-bottom profiler, sidescan sonar and multibeam surveys. The specifications of these surveys were of increased resolution compared to the previous survey, allowing better identification of any buried anomalies to be avoided during dredging works. Possible archaeological anomalies within the dredge footprint will be subject to appropriate exclusion zones during dredging.

Anomalies may exist in the eastern half on the licence area but were not detected by the geophysical survey as they are buried.

Section 14.5.2 of the *Goodwin Sands Aggregate Dredging Environmental Statement* sets out mitigation measures to avoid direct impacts with *known* heritage assets. Section 14.6.1 provides a list of mitigation measures to reduce the significant adverse impacts to unidentifiable heritage assets, including:

- Archaeological assessment of pre-dredge and post-dredge geophysical survey;
- On board archaeological monitoring during dredging;
- Archaeological monitoring during discharge of dredged material at the DWDR reclamation site;
- Implementation of an archaeological protocol for reporting discoveries of archaeological interest; and
- Additional mitigation in the event that anomalies of possible archaeological interest cannot be avoided.

The methodology for these mitigation measures has been set out in a draft archaeological Written Scheme of Investigation (WSI) to be agreed by DHB with Historic England and the MMO prior to the commencement of dredging. These measures will reduce the residual impacts of the proposed dredging works to "minor significant adverse".

Additionally, at the request of Historic England, DHB has carried out extensive additional survey work on the proposed dredge area. The suite of work completed includes magnetometer, sub-bottom profiler, multibeam and sidescan sonar surveys. These further surveys have facilitated identification and avoidance of anomalous features of possible heritage interest. Furthermore, the dredge depths will not exceed the depths reached by the sub-bottom profiler and magnetometer data which provides a high level of confidence that the risk of encountering buried heritage assets during dredging is low.

Even with the buffer zone, the impact and vibration caused by nearby dredging could disturb or damage the wreck of the Admiral Gardner.

Section 14.4.2 of the *Goodwin Sands Aggregate Dredging Environmental Statement* discusses the wreck of the *Admiral Gardner*, and clarifies that proposed dredging works will meet the requirements for a 300m exclusion zone, in line with its protected status under the Protection of Wrecks Act 1973. This wreck lies outside the proposed area of dredging activity, and so impacts to the wreck are not anticipated. Furthermore, ongoing monitoring of the wreck by Historic England's archaeological contractors has shown that the wreck is currently buried under several metres of sand thereby offering additional protection to the surviving wreck structure. Historic England, the government's advisors on protected wreck sites, have been fully consulted at all stages of the planning of archaeological matters and are supportive of the arrangements made.

One of the key considerations in selecting the proposed dredge area was to mitigate impacts on historic wrecks & particularly on the *Admiral Gardner*. The previously licensed Area 342 at the Southern Goodwins enclosed the position of the Admiral Gardner, and so it was decided to apply for a completely new area to the west of Area 342. The new dredging area applied for is at least 450m to the west of the location of the Admiral Gardner at its closest point. The use of a Trailer Suction Hopper Dredge for the vacuuming of material from the seabed is a low-impact, low vibration method, and it will not have any impact on the Admiral Gardner or other wrecks that are further away from the dredging area.

Is there a risk of the dredging disturbing historic contaminated sediments?

Section 7 of the *Goodwin Sands Aggregate Dredging Environmental Statement* assessed the risk of increased contamination in the water column from disturbance to contaminated sediment. The offshore location of the proposed dredge area is such that very few sources of contamination are located nearby, unlike in coastal areas where the number of potential sources of contamination are greater. The most common offshore activities which can affect sediment quality are usually associated with offshore disposal of dredged material (both present and historical) and activities associated with oil and gas exploration. However, the potential for these activities to affect sediment quality directly at Goodwin Sands is very low, given the distance from these activities to the proposed dredge area. Additionally, the low silt component within the sediments within the proposed dredge area further reduces the risk of disturbing significant levels of contamination.

The results of the trace metal and organotin analysis are presented in Table 7.4 of the Environmental Statement. Results for the PAH analysis are not presented within this table, as the majority of samples were found to be lower than the limit of detection. The exceptions were Stations 37, 46 and 47 where levels of various PAHs were recorded but none were above the guideline Cefas Action Level 1 (see Appendix 8.1 of the ES for the PAH data). Note that these stations are located outside of the proposed dredge area. The only parameter exceeding Cefas Action Level 1 is arsenic. All other parameters recorded results either below Action Level 1 or below the limit of detection. The levels of arsenic are, however, only marginally over the Action level 1 and therefore would not be considered to be highly contaminated. Additionally, it is worth noting that the arsenic concentrations in the proposed dredge area, with the exception of Station 1, do not exceed Cefas Action Level 1.

The sensitivity of the receiving water is low because of the dilution effect it will have on the suspended sediment and mobilised contaminants that will be dispersed during dredging. Since the receiving water is deemed to be of low sensitivity and value, and the magnitude of contaminant increase is predicted to be negligible, an overall impact of negligible significance is predicted. The probability of a significant adverse impact occurring is unlikely given that the baseline survey information confirms very little contamination is present in the proposed dredge area. Therefore, no mitigation measures are deemed necessary for this issue.

Will marine mammal observers be employed during dredging at night?

Marine Mammal Observers (MMOs) will be utilised during the first dredging period (see below excerpt from *Goodwin Sands Aggregate Dredging Environmental Statement*):

The MMOs would observe marine mammals around the vessel and alert the crew if there is any potential risk of a collision, so that, where possible, suitable actions (e.g. reducing speed, not intercepting the animal's travel path or approaching the animal head on, stopping works, alerting other vessels) can be taken, if required, to avoid any collisions or risk of injury to marine mammals. During and after the first season, the observations by the MMOs will be reviewed to determine if any mitigation is required and if MMOs need to be deployed for the second and/or third dredging periods.

These MMOs will be used throughout the first dredging period, including periods of night dredging. Upon granting of a marine licence by the MMO, any use of Marine Mammal Observers will be compliant with the requirements set out by the conditions of that licence.

Further palaeoenvironmental surveys of geoarchaeological potential should be undertaken.

The only further survey requested by the MMO was a magnetometer survey of the entire proposed dredge area to understand the risk of unknown maritime or aviation archaeological remains indicated by the presence of ferrous material. The data collected was to then be assessed and interpreted by a suitably qualified marine archaeologist. In addition to the required magnetometer survey, DHB has undertaken a suite of other surveys that have been interpreted by leading experts Wessex Archaeology.

The planned shallow dredging will impact marine sediments only, and there is no potential for impact to underlying geological deposits of potential palaeoenvironmental interest. Historic England, statutory advisers to the MMO on the historic environment, have been fully consulted at all stages of the planning of archaeological matters and are supportive of the arrangements made.