GOODWIN SANDS CONSERVATION TRUST

www.goodwinsands.org.uk

A QUALITATIVE ANALYSIS OF DOVER HARBOUR BOARD'S BATHYMETRIC MODELLING FOR THEIR 2016 AGGREGATE EXTRACTION LICENCE APPLICATION FOR THE GOODWIN SANDS

March 2024

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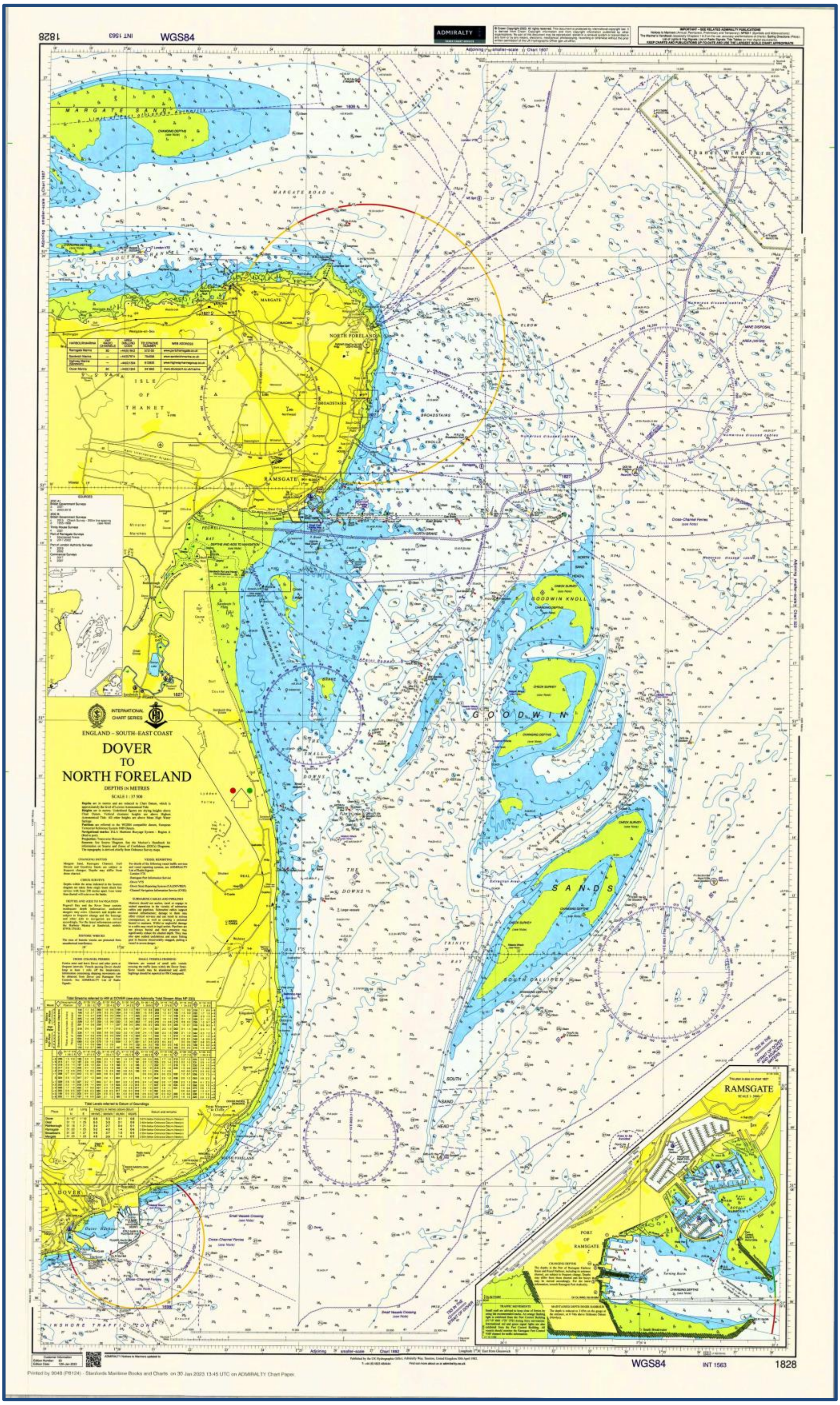

2021 edition Admiralty Chart 1828 Dover to North Foreland

Credit: The Keeper of Public Records and the UK Hydrographic Office (www.GOV.uk/UKHO)

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Joanna Thomson
March 2024

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Foreword

Offshore sources of aggregates are increasingly required for land-based construction projects, as well as for beach nourishment. In response to the growing demand for these aggregates it is important to understand the role offshore sediment sources play in nearshore wave and current processes which in turn control and drive shoreline dynamics and stability. To achieve such enhanced understanding, we need: (1) comprehensive, accurate and, ideally, regular monitoring of offshore sediment bodies; and (2) improved insights into how these sediment bodies interact with the coast through wave and current hydrodynamic and sediment transport processes. The former requires comprehensive bathymetric surveys and the latter state-of-the art numerical models capable of simulating morphodynamic coastal behaviour. Both actions are required to support sustainable aggregate extraction practices.

The Goodwin Sands Conservation trust has rightly questioned the historic approach that has been taken in allowing extraction from sites where monitoring and modelling has been lacking in rigor. Through their own research and by engaging others they shine a light on discrepancies and gaps in data provision and understanding of the Goodwin Sands system. The importance of the offshore sand banks in regulating nearshore processes along the Kent coastline, and beyond, is recognized, but not robustly quantified. To evaluate the impact of future aggregate extraction, required to obtain the relevant licenses, it will be necessary to have a better understanding of the dynamics in this region, which is only possible through improved mapping and numerical modelling. A particularly pertinent question in this context is: what has been the coastal impact of the cumulative dredging that has occurred in the region over the past decades?

The University of Plymouth will be happy to work with partners and government agencies to address the concerns raised and ensure the cumulative impact of extraction operations is effectively modelled to ensure wider impacts are not detrimental to the region.

Professor Gerd Masselink — 12th March 2024
Professor of Coastal Geomorphology
School of Biological and Marine Sciences (Faculty of Science and Engineering)

Executive Summary

This report investigates the bathymetric (depth of seafloor) modelling carried out by Dover Harbour Board (DHB) for their 2016 aggregate extraction licence application for the Goodwin Sands. Given that The Crown Estate has informed us they intend to put the Goodwins out to tender again at some time in the future, we felt it important to ensure that further bathymetric modelling is fit for purpose.

Our research involved scrutinising the datasets and modelling used by consultants H R Wallingford, examining Dover Harbour Board's historic surveys of the Goodwin Sands and studying relevant Admiralty charts. Our main conclusions are:

- The datasets used in HRW's bathymetric analysis are **limited** and should not have been relied upon solely
- DHB's survey grid lines were too far apart to capture sufficient bathymetric data in order to calculate **volume changes accurately**
- The impact of removing less than **1/4 million m^3** of sand was assessed rather than the proposed **2.5 million m^3**
- Changes in bank development over a possible maximum of **eleven years** was evaluated rather than the intended **20 years**
- H R Wallingford's claim that bank levels had not lowered following previous aggregate extraction appears to be **unsubstantiated**
- It appears that the **regulatory bodies** charged with evaluating the Environmental Impact Assessment **did not verify** this claim
- The bathymetric modelling did not address the potential **adverse impact** of aggregate extraction on **Protected Wrecks**

We have made several key recommendations to address these issues:

- Data collected in a bathymetric survey should be of sufficient **high quality** (meeting International Hydrographic Organisation Standards) agreed in advance with regulators
- A bathymetric comparison of the **whole sandbank complex** should be carried out
- **Changes** to intertidal areas over time should be q**uantified** by digital mapping
- These comparisons should preferably cover a period of preferably **30 years** in order to characterise long-term trends and shifts in the overall sand system
- The **cumulative impact** of all historical extractions should be assessed
- The effect of aggregate extraction on **Protected Wrecks** should be addressed in the bathymetric modelling
- More **detailed examination** of studies made **on behalf** of developers is required
- **The Crown Estate**, as authorising agency and the **Environment Agency** as environmental regulator should satisfy themselves that EIA surveys are **fit for use**

Background

The Goodwin Sands Conservation Trust (GSCT) was created in 2018 during the SOS campaign to prevent dredging of the Goodwin Sands by Dover Harbour Board. With world sand stocks diminishing rapidly and developers turning to the seabed for construction supplies, it became clear that the Goodwins have been identified as a valuable and conveniently located resource.

The aim of GSCT is to raise public awareness about the cultural, environmental, and historical significance of the Sands. Known as the 'ship swallower' the Goodwins are the site of some 2,000 recorded shipwrecks, though the true number is nearer double this. Submarines and military aircraft - and their crews - from WWII (and perhaps WWI) also lie buried here.

At low tide, the sandbanks provide haul-out sites for a large colony of both grey and harbour seals (over 700 at the last count) and in 2019 a 277 km^2 area around and including the Goodwins was created a Marine Conservation Zone.

The Goodwins play an important role as a vital sea defence for the vulnerable East Kent foreshore; it is this function that prompted our research and this subsequent report.

We hope you will find this report both interesting and of value.

Introduction

In 2016 Dover Harbour Board (DHB) applied to the Marine Management Organisation (MMO) for a marine licence (MLA/2016/00227) to extract 2.5 million m^3 of aggregate from the South Goodwins sandbank. This application was accompanied by an Environmental Impact Assessment (EIA), the basis of which constituted a Coastal Impact Study (CIS).

The initial part of the CIS was undertaken by DHB's consultants, H R Wallingford (HRW) in 2008 and comprised a bathymetric analysis of a small area of the South Goodwins. The study concluded that bank levels had recovered following previous aggregate extraction in 1998 – 1999.

Goodwin Sands Conservation Trust (GSCT) believes that the survey data used for this CIS were not fit for purpose and the conclusion that bank levels had not lowered as a result of previous aggregate extraction is unreliable.

Maintaining the height of the sandbanks is crucial as lowering them has the potential to reduce the shelter the Goodwins provide to the shore which is vulnerable to persistent long-shore drift to the north. This was recognised by DHB's consultants Royal Haskoning DHV (RHDHV) '*The Goodwin Sands sand banks provide protection to the Kent shoreline between South Foreland in the south and Ramsgate in the north'.*[1]

The Goodwins are recognised as a 'closed system' meaning that no great quantity of sand moves either in or out.[2] Any sand removed through aggregate extraction will never be replaced although sediment may move from within the system to cover the area of loss.

The Crown Estate has informed GSCT that at some point in the future it intends to put the Goodwin Sands out to tender again for aggregate extraction. We therefore consider it extremely important to demonstrate the need for robust bathymetric modelling in advance of any future aggregate extraction. The stability of the East Kent foreshore in the decades to come depends upon it, especially when considering the added impact of climate change in the form of rising sea levels and increased storm frequency and intensity.

Coastal Impact Study

In 2008, DHB commissioned H R Wallingford to carry out an initial Coastal Impact Study. This study is entitled *'Goodwin Sands Study of Historical Changes Technical Note DDM6-67/TN01'* and referred to more simply as H R Wallingford (2008). In it, HRW acknowledged the role of the Goodwin Sands as a sea defence. The study focussed on three primary concerns:

- *possible lowering of the crest of the sandbank, reducing shelter to the coastline*
- *other changes to wave transformation patterns over the whole of the Goodwin Sands which could affect waves arriving at the coastline.*
- *alterations to sand transport pathways which may affect any sand supply to Sandwich Bay or other parts of the coast.*[3]

[1] Goodwin Sands Aggregate Dredging Environmental Statement Volume 1 NTS Final 1 section 5.4.5 2016

[2] Hydrographic Analysis of the Goodwin Sands and the Brake Bank R.L Cloet page 12 and Goodwin Sands Study of Historical Changes Technical Note DDM6-67/TN01 page 5 courtesy of DHB

[3] Goodwin Sands Study of Historical Changes Technical Note DDM6-67/TN01

A phased approach to the CIS was agreed and the first task was '*to analyse the recent changes in the bathymetry of the South Goodwin Sands, calculating volume changes to assess the development of the bank over time'.*[4] HRW acknowledged that '*if it was found that the volume of the South Goodwin sands was decreasing already, dredging the bank would add to that trend and hence expose the coastline to larger waves. It was considered unlikely that if this were the case, permission for extraction would be granted and there would be no gain in continuing with the proposed future parts of the CIS'.*[4]

To carry out this analysis, HRW intended to use three sets of data which they hoped '*would provide a good indication of changes over this period'.*[4] It is assumed these datasets were collected from surveys commissioned by DHB for previous aggregate extraction campaigns on the South Goodwins between 1976 - 1999.

- 1986 – 1988 (Hereinafter 'Set A') available as fairsheets.
- 1995 – 1998 (Hereinafter 'Set B') available as fairsheets.
- 2006 - (Hereinafter 'Set C') available in digital format [4 & 5]

From the fairsheets (see example in Figure 2) it appears that a singlebeam sonar that produces a single line of data was used. However, this would provide only coarse information not suitable for accurate volume calculations. Current surveys on this scale would use multibeam sonar providing large coverage over the seabed and therefore much more data.

In the event HRW considered that dataset A '*is unfortunately not complete enough to be as much of value as the other surveys so only the 1995 – 1998 and 2006 datasets have been used to calculate volumes'.*[4] Dataset A coincided with the extraction of 1.85 million m^3 in 1986 – 1988 (Area 342/1 - see Table 1).

The results of analysing the two remaining datasets determined that despite the previous dredging of the South Goodwin sands '*the overall change in bed levels in this part of the sandbank is very small indeed, indicating that bank levels had recovered since that extraction'.*[5]

HRW had calculated the changes in volume of the bank between 1995 - 2006. They established that whilst it had decreased slightly above the -10 M Chart Datum (CD) level the volume had increased significantly above the 0 m – 1 m contours. HRW concluded that the sandbanks are in a '*state of dynamic equilibrium, whereby their general morphology changes but their overall volume hardly alters'*.[5]

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[4] Goodwin Sands Study of Historical Changes Technical Note DDM6-67/TN01

[5] Goodwin Sands Environmental Statement Volume III Appendices Part II Section 2.2.2

Between 1998 - 1999 244,060 m^3 of sand were removed from the South Goodwins by Dover Harbour Board (Area 342/1 see Table 1). In correspondence with GSCT in December 2020 Professor Masselink stated that '*a single amount of 1.1M tonnes (*approx. 733,000 m^3) *is not going to make a measurable impact'.* Perhaps it is therefore not surprising that HRW's calculations showed that the volume of the sand bank had not changed.

The conclusion was carried over into the CIS in the EIA which subsequently stated '*This means that the extraction did not lead to long-term lowering of the bank and bank levels have recovered since that extraction (H R Wallingford 2008)'*.[6] It was on the basis of this statement that the Environment Agency accepted that dredging the Goodwins would not have any adverse impacts on the East Kent coast.

Despite being referred to repeatedly in the EIA, the HRW 2008 study is not in the public domain.

GSCT Analysis

This section presents a review of reports and datasets made available to GSCT and relevant to the Goodwins. Given the level of expertise within the GSCT team this review is not meant to be exhaustive or complete. We present a synthesis of the work we have undertaken with the hope that we can highlight particular concerns which we believe need to be addressed in any future aggregate extraction consenting process.

Historic Dredging of the Goodwin Sands

Our research focussed on the UK Hydrographic Offices (UKHO) Archives in Taunton and was carried out between May 2020 and August 2021. DHB kindly gave permission for us to access their historical bathymetric surveys and the UKHO Archives hold every published Admiralty chart. Chart 1828 covers the area from Dover to North Foreland that includes the Goodwin Sands.

The Crown Estate kindly provided information on historic dredging on the Goodwin Sands (see Table 1 and Figure 3). Table 1 shows that during the intended time of HRW's 2008 study (1986 – 2006) 1.85 million m^3 of sand were extracted from the South Goodwins between 1984 – 1988 and a further 244,060 m^3 were taken between 1998 -1999.

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[6] Goodwin Sands Environmental Statement Vol II EIA Outcome Part 1 – 2 Section 6.5.9.

Historic dredging of the Goodwin Sands – Source: The Crown Estate 2020

Area name	293/1	304	342/1	352	365	342/2	Totals
Extent	South Goodwins – extent unknown	South Goodwins – extent unknown	South Goodwins See 342/2	North Goodwins 10.9 km^2	N Goodwins 2.7 km^2	S Goodwins both 342s 3.5 km^2	
Licencee	Dover Harbour Board	Dover Harbour Board	Dover Harbour Board	Port of Ramsgate	Westminster Dredging	Dover Harbour Board	
Licence dates	July 76 – July 77	June 78 – May 79	1984-1988	1986 – 1990	1988 – 1989	1998 – 1999	
Amount extracted tonnes	1,109,964	874,469	2,775,898	589,392	3,926,732	366,090	**9,641,590**
Amount extracted m^3	739,976	582,979	1,850,599	392,928	2,617,821	244,060	**6,428.363**
Pre-dredge survey & post dredge monitoring	None	None	None	Pre-dredge survey* commissioned by Thanet Council – Parsons Brown & Newton, Consulting Engineers	None	Pre-dredge bathymetry survey (03/98) ABP Research & Consultancy	
Purpose of extracted sand	Construction of Dover hoverport	Dover Eastern Docks reclamation	Dover Eastern Docks reclamation	Sea wall & associated land reclamation	Channel Tunnel works	Dover Eastern Docks freight storage area	
Notes	*Admiral Gardner* dredged over – coins found in landfill		It appears the Protected Wreck site of the *Admiral Gardner* was dredged over	*'The Prospects of Obtaining Sand Fill from the North Goodwins (date unknown)		Is a copy of the pre-dredge survey available?	m^3:tonne – 1:1.5

Goodwin Sands Conservation Trust 2021

Table 1. Historic dredging of the Goodwin Sands – Source: The Crown Estate

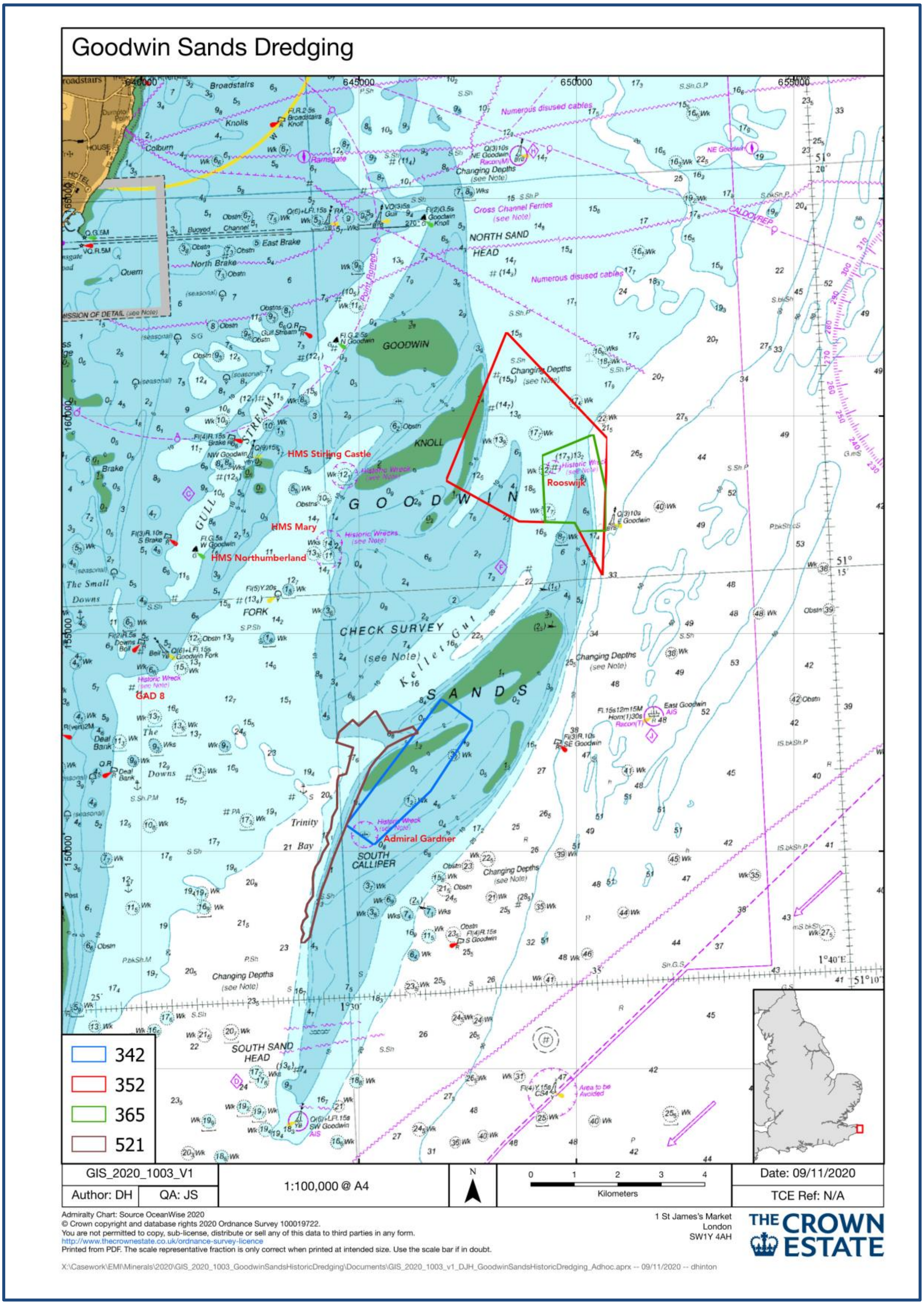

Figure 3. Hydrographic chart showing historical licensed dredge sites
Source: The Crown Estate

Between 1976 – 1999 6.4 million m^3 of sand were removed from the North and South Goodwins. About 3 million m^3 of this was from the North Goodwins for construction projects at the Port of Ramsgate and Channel Tunnel (dredge areas 352 and 365 in Figure 1). The remaining 3.4 million m^3 were taken by Dover Harbour Board from dredge areas 293/1 and 304 (locations unknown) and dredge areas 342/1 and 342/2 – all on the South Goodwins. This was for works at Dover hoverport and Dover Eastern Docks.

DHB commissioned 13 surveys of the South Goodwins between 1984 – 1998, each appearing to cover the same 24 km^2 area. The surveys all followed a similar format consisting of a grid of six lines or seven lines 1000 m apart transected by three lines 1500 m apart (see Figure 2) producing a series of 4 or 5 fairsheets of the results (see Figure 3).

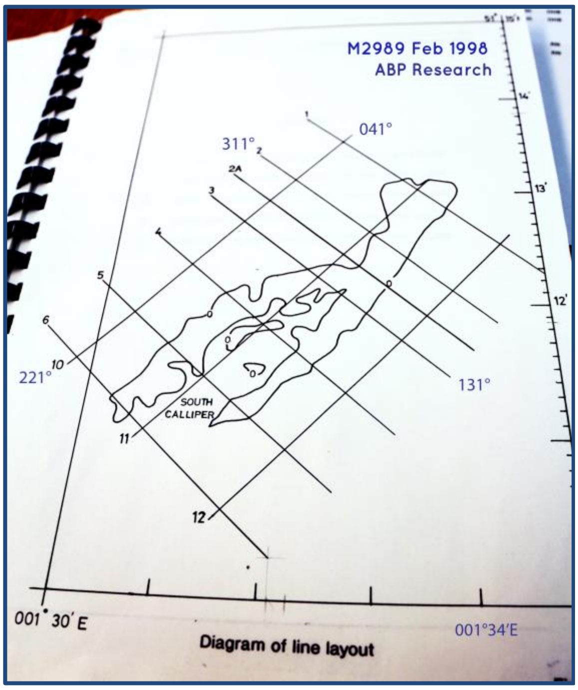

Figure 2. Grid lines from Feb 1998 survey

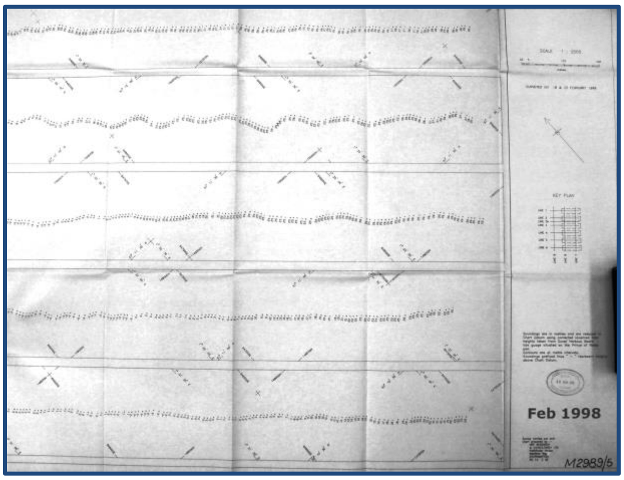

Figure 3. Fairsheet from Feb 1998 survey showing a single line of data

The DHB surveys corresponding to the datasets likely to have been used by HRW in their 2008 study are:

Dataset A (1986 – 1988)
March 1986, April 1987, Aug/Sept 1987, January 1988 and June 1988

This dataset that HRW considered incomplete and unfit for use covers part of the period during which 1.85 million m^3 of sand were extracted from the South Goodwins between 1984 – 1988.

Dataset B (1995 – 1998)
Sept/Oct 1995, May 1997, February 1998 and June 1998

Dataset B covers the period when 244,060 m^3 were removed from the South Goodwins from 1998 – 1999 and was the last dredging campaign on the Goodwins.

Dataset C (2006)
We asked H R Wallingford for a copy of dataset C as it was not held at the UKHO Archives. We were told by HRW that '*the 2006 survey was supplied as a single dataset from the UKHO for the 2008 historical bathymetric changes study but unfortunately that archived data has been corrupted so we don't have access to any metadata'.*[7] According to our enquiries, the UKHO Archives have no record of any 2006 survey data or of it being sent to HR Wallingford.

With the exception of the survey conducted in Sept/Oct 1995, the data for datasets A and B were all collected by ABP Research Ltd.

[7] Pers. comm with HRW July 2021

Hydrographic Surveys

Under their Routine Resurvey Programme, bathymetric surveys of the whole of the Goodwin Sands are undertaken for the Marine and Coastguard Agency (MCA) for navigation purposes every twelve years. The Admiralty chart 1828 is subsequently updated in a New Edition about a year later – the four most recent full (GS4) surveys of the Goodwins were in 1985, 1997, 2009 and 2021. The two most recent surveys give depth values every 2m in all horizontal directions. Their data is readily available from the Admiralty Marine Data Portal.

We next looked at the historic Admiralty charts of the Dover Straits for 1987, 1998 and 2005 as these correspond chronologically with datasets A, B and C. This was to identify any changes in the extent of the intertidal areas during this period. Any reduction in these areas would indicate a lowering of the crest height of the sandbank.[8]

The intertidal areas on the South Goodwins and the southernmost area on the North Goodwins i.e., those closest to the historic dredging sites were traced out on each chart and their extent calculated using a Geographical Information System (GIS). The results were then overlaid using a 2021 Admiralty chart as a background – see Appendix A Figures 5 – 8.

The results are as follows:

1987 - the intertidal area was 8.218 km^2
1998 - the intertidal area was 6.785 km^2
2005 - the intertidal area was 5.924 km^2

The MCA has stated that the extent of the intertidal areas is not 100% accurate since the survey ships cannot access the shallower areas. However, these figures give an indication that there was a diminution of intertidal areas by about 27% between 1987 and 2005.

Between 1987 – 1998 the intertidal areas we analysed decreased by 1.43 km^2. This followed the removal of 1.85 million m^3 of sand from the South Goodwins between 1984 – 1988 (dredge site 342/1).

From 1998 – 2005 the same intertidal areas decreased by a further 0.86 km^2 during which time 244,060 m^3 of sand were removed (dredge site 342/2 – 1998 - 1999).

It is therefore difficult to see how HRW could be so definitive that bank levels had recovered following previous dredging.

[8] Pers. comm with Professor Masselink May 2021

Although the 2005 chart is available in a digital version, the two earlier versions are not, thereby unfortunately excluding the possibility of analysing the exact changes. However, going forward, advances in GIS make it perfectly possible for any bathymetric modelling to include a digital evaluation of changes to the intertidal areas.

The MCA surveys and Admiralty chart treat the Goodwin Sands as one complex. It can be argued therefore that removal of sand from one area will have a knock-on effect elsewhere. Thus, when analysing the impact of aggregate extraction, it is important to assess potential bathymetric changes to the whole area – not just where the proposed extraction is to take place. Although the Sands are generally considered to be dynamic, this does not mean the system responds positively to external pressures and the outcome of the removal of an unnaturally large amount of sediment from one particular area cannot be predicted.

Section Summary

Historic dredging and surveys

- **6.4 million m^3** of sand were extracted from the Goodwins **1976 – 1999** including:
    - **1.85 million m^3** from South Goodwins **1984 -1988** and
    - **244,060 m^3** from South Goodwins **1998 - 1999**
- DHB commissioned 13 surveys **1984 - 1998** appearing to cover the same **24 km^2** area
- These surveys formed a similar grid of **six or seven** lines at a spacing of **1000 m** with three transect lines spaced at **1500 m**
- These surveys used **singlebeam** sonar providing a **single** line of data which is **too coarse** for **accurate** volume calculations
- A calculated comparison shows a **diminution** of intertidal areas from **1987 – 2005**

HRW 2008 Technical Summary

- HRW considered dataset A (**1986 – 1988**) to be **incomplete** and **not fit for use**
- This dataset covered some of the period when **1.85 million m^3** of sand were extracted
- **Only dataset B** collected in **1995 - 1998** can be validated
- According to HRW Dataset **C** from a **2006** survey has been corrupted and cannot be accessed
- The period for comparing bank development appears to be at the **most eleven years** not the proposed **20 years (1995 – 2006)**
- HRW's 2008 study only analysed **a fraction** of the amount intended for extraction - less than **¼ million m^3** which is **10 times less** than the **2.5 million m^3** initially proposed by DHB

Marine & Coastguard Agency Surveys

- A full GS4 survey of the Goodwins covers an area of **96 km^2**
- Modern MCA surveys give a depth value every **2m in** all horizontal directions
- Digitised Admiralty charts can facilitate **GIS mapping** of changes to intertidal areas

Expert Review

In support of our analysis, we consulted with leading academic researchers on relevant studies and their opinions. In February 2020, Professor Gerd Masselink, Professor of Coastal Geomorphology at the School of Biological and Marine Sciences at the University of Plymouth and colleagues published a paper about their research on the offshore Skerries Bank in Start Bay, Devon. [9]

This study showed for the first time, that removing, lowering, or raising a headland-associated sandbank can have a significant impact on longshore sediment transport. Results indicated that removing or lowering the bank by up to five metres generally reduces dissipation of waves on the sandbank and increases wave height, increasing longshore flux at the shore.[10]

Cumulative Impact of Historical Dredging

In a letter to GSCT dated 10 January 2021, Professor Masselink stated '*Goodwin Sands is a very large sand bank system with a sediment volume I estimate at 500 million – 1 billion m^3. The bank system is partly emerged at low tide and is located only 10km offshore the Deal coast. As such, it will exert a very significant influence on wave conditions at the coast and the associated longshore sediment transport rate and direction.*

Removal of 6.4 million m^3 from Goodwin Sands over the period 1976-1999 may seem insignificant compared to the total volume of the bank system, but, depending on where this sediment has been extracted from, it may have a significant influence on the shoreline wave conditions and dynamics.

Therefore, I would suggest that as part of the approval process for single sediment extraction *schemes at Goodwin Sands, an evaluation of the cumulative impact of several decades of sediment extraction at this location, especially on the coastal wave conditions, longshore sediment transport and shoreline dynamics, should be an essential component of an EIA'*

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9 Impact of a headland-associated sandbank on shoreline dynamics McCarroll, Jak 2020

10 GSCT is indebted to Professor Robert Duck for drawing our attention to this research

On 12th January 2021, Professor Robert Duck, Emeritus Professor of Environmental Geosciences at Dundee University also wrote to GSCT '*The Goodwin Sands represent a major offshore sandbank, partially emergent at low water. As such, the sands afford very significant natural protection to the East Kent coast acting, in effect, as a natural breakwater to incoming waves from the north-east, east and south-east.*

*It is in my professional opinion that the collective extraction of aggregate over the past 45 years should have been carefully considered as the cumulative quantities could have had a significant impact on local longshore sediment dynamics and, importantly, on coastal erosion at locations such as Oldstairs Bay at Kingsdown and Deal. It is furthermore my contention that this should have been considered fully before granting of any further aggregate extraction licence***'.**

Coastal Management

The Goodwin Sands act as a natural wave break by dissipating waves' energy before they reach the shoreline between Deal and Kingsdown. It is therefore essential that the impacts from lowering the bank height on coastal management are thoroughly researched and understood before industrial scale sediment extraction is permitted.

Coastal management for the shore facing the Goodwin Sands is informed by the Shoreline Management Plan (SMP) *Isle of Grain to South Foreland* [11] published in 2010. Further south, management is covered by the *South Foreland to Beachy Head* plan[12] published in 2006. Both these management plans are currently being refreshed. The South East Coastal Group '*brings together local authorities, the Environment Agency and other maritime operating organisations to achieve co-ordinated strategic management of the shoreline between the Thames Barrier and Selsey Bill.*[13]

Shingle beaches are the dominant coastal form in the south-east and whilst only parts of the coast have conservation and geological designations associated with the shingle, the habitat is covered throughout by Local and National Biodiversity Action Plans (BAPs), targets for which include no further net loss.[14]

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[11] https://se-coastalgroup.org.uk/shoreline-management-plans/isle-of-grain-to-south-foreland/

[12] https://se-coastalgroup.org.uk/shoreline-management-plans/south-foreland-to-beachy-head/

[13] https://se-coastalgroup.org.uk/accessed January 2024

[14] https://se-coastalgroup.org.uk/shoreline-management-plans/south-foreland-to-beachy- head/section 4.2.2 accessed January 2024

It is accepted that *'from a historic perspective these beaches have been retreating for centuries as sea levels have slowly risen and land levels have gradually dropped, so coastal erosion is nothing new'*.[12] However, we are now more aware of this than in the past and climate change in the form of increased storm frequency and intensity and higher rainfall are adding further pressures.

Beach reduction is largely a result of the naturally occurring northwards long-shore drift although it is interrupted by harbour arms at Folkestone and Dover and the decaying concrete walls of the WWII firing range at Kingsdown.

With the exception of the stretches of chalk cliffs, the objective of the SMPs between North Foreland and Dungeness is to *'Hold the Line' in the present, medium and long term.* It aims to do this *by maintaining and upgrading sea defences as required to protect assets situated on the coast.*[13]

Figure 4. Oldstairs Bay, Kingsdown, Kent – sixty years of change 1960 - 2023

Dover District Council (DDC) manages the coastline for the 4.5 mile stretch of beach between Kingsdown and Sandown Castle at Deal. DDC acknowledges that '*The current situation is that of steady erosion along most of the frontage* (Deal to Kingsdown) *except in the Walmer area where some accretion is occurring. … In addition to the gradual retreat of the shoreline, occasional severe storms cause dramatic loss to the coast and high costs as a consequence of associated flooding'.*[15]

Since 1974 nearly 757,000 m^3 of shingle have been used in beach recharging and recycling work between Sandown Castle and Kingsdown. DHB's 2016 EIA only included beach recharge and recycling figures between 1974 – 2004; in fact, a much bigger assessment was available from information easily obtained from DDC but was not included.

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[15] https://www.dover.gov.uk/Environment/Coast--Rivers/Coast-Protection/Coastal-Erosion.aspx accessed February 2024

Oldstairs Bay in Kingsdown has been particularly affected by coastal erosion and Figure 4 shows the significant change in the width of the beach there from 1960 - 2023.

In 2004 Folkestone & Hythe District Council introduced 360,000 m^3 of shingle to the beach between Folkestone Harbour and Hythe – a distance of 4.3 miles – and since then they have recycled about 240,000 m^3 of shingle annually. Shingle there is being lost on a year-on year basis with a bigger volume required each year to maintain beach levels. This is stated to be due to the coast facing more storm events and its' orientation towards the Atlantic and SW winds.[16]

The Environment Agency is responsible for beach management between Hythe and Dungeness. It has confirmed that the only recent shingle recharging works along this stretch have been at Hythe Ranges (300,000 m^3) and LIttlestone where 385,000 m^3 of shingle have been recharged / recycled since 2004.

Protected Wrecks and our Underwater Cultural Heritage

According to DHB's archaeological advisor Wessex Archaeology, the Goodwin Sands '*have the highest density of wrecks and therefore of marine heritage assets in the UK* … and … *they acquired a reputation for being abnormally well-preserved wrecks* …. and … *due to this combination of asset numbers and preservation, the Goodwins also contain one of the highest densities of designated marine heritage assets in the UK'.*[17]

There are seven Protected Wrecks located around the Goodwin Sands – *Admiral Gardner, Gad 8, Northumberland, Mary, Restoration, Rooswijk* and *Stirling Castle* and one Scheduled Monument *Gad 23* known as the bowsprit wreck.[18] *Northumberland, Restoration* and *Rooswijk* are also on Historic England's At Risk register.[19]

These wrecks were all discovered after fishermen reported net fastenings to the local diving community subsequent to historic dredging campaigns (see Table 2) The most culturally significant of these discoveries are the *Stirling Castle* (found virtually intact in 1979) and the *Northumberland* (discovered in 1980). The site of the *Rooswijk* was first located in 1990 through a magnetometer reading (following dredging in Areas 352 and 365 - see Figure 3) but she was not actually discovered until becoming uncovered from sand in 2004.

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[16] Folkestone & Hythe District Council pers. comm January 2024

[17] https://historicengland.org.uk/research/results/reports/10-2024

[18] https://historicengland.org.uk/listing/what-is-designation/protected-wreck-sites/

[19] https://historicengland.org.uk/advice/heritage-at-risk/protected-wreck-sites-at-risk/

The Restoration site was first exposed in 1979 at a time when Area 342 was being dredged for aggregate. It was then reburied until the late 1990s when part of the site was uncovered as the sand receded again.[20] This site actually comprises two wreck mounds which are thought to be the *Restoration* and the *Mary* and archaeological work continues to officially identify them.

The *Admiral Gardner* was not only discovered through dredging in 1976 but the site appears to have been dredged over again in 1998 - 1999 despite having been designated a Protected Wreck in 1985 (see dredge area 342 in Figure 1).

Any industrial scale removal of sand through marine extraction must therefore consider the indirect effect of exacerbated sand movement on the Protected Wrecks. As sand is removed from one location it may have an undetermined knock-on effect elsewhere, thereby justifying a precautionary approach.

[20] HMS *Restoration* draft Conservation Statement & Management Plan 2022 Section 7.7

Dredging dates	Area name and size	Amount removed	Developer	Name of ship & year discovered	Comments
1976-1977	Area 293/1 Extent unknown	1,109,964 tonnes 739,976 cu metres	Dover Harbour Board	*Admiral Gardner* - 1976	*Admiral Gardner* discovered during dredging for Dover Eastern Docks project
1978-1979	Area 304 Extent unknown	874,469 tonnes 582,979 cu metres	Dover Harbour Board	*Stirling Castle* - 1979	First discovered in 1979 then recovered with sand until 1990
				Restoration & Mary -1980	
				Northumberland - 1980	
1984-1988	Area 342/1 See total in box below	2,775,898 tonnes 1,850,599 cu metres	Dover Harbour Board		
1988 – 1989	Area 342/2 3.5 km^2	366.090 tonnes 244,060 cu metres	Dover Harbour Board	Area containing the *Admiral Gardner*	*AG* site apparently dredged over again despite being listed as a Protected Wreck in 1985
1986 – 1990	Area 352 10.9 km^2	589,392 tonnes 392,928 cu metres	Port of Ramsgate	*Rooswijk - 1990*	*Rooswijk's* location was first identified by a magnetometer survey in 1990.but did not uncover until 2004
1988 – 1989	Area 365 2.7 km^2	3,926,732 tonnes 3,272,277 cu metres	Channel Tunnel		Small area. Dredged to a deep depth?

Goodwin Sands Conservation Trust 2024

Table 2. Historical dredging and discoveries of Protected Wrecks

Summary

The shoreline facing the Goodwin Sands experiences constant beach erosion on account of naturally occurring pressures such as long-shore drift, rising sea levels, sinking land mass and climate change. Potential additional impacts from lowering the crest height of the Goodwin Sands must therefore be fully investigated before further aggregate extraction is permitted.

Questions arising from our Research:

- Why did HRW consider dataset A (1986 – 1988) **incomplete**?
- If dataset A was not fit for use, why did HRW not use **earlier datasets** collected by DHB in 1984-1985?
- Why is there no **lasting record** of dataset C and the 2006 survey?
- As dataset A is considered incomplete, dataset C cannot be accessed and dataset B only covers the period 1995 - 1998, did the study **analyse** the development of the bank over **20 years** as intended?
- Given that the MCA states that the extent of the intertidal areas on the Admiralty chart are **not 100% accurate**, how can HRW **definitively** claim that bank levels **did not lower** as a result of previous aggregate extraction?
- Did the **regulatory bodies** charged with evaluating the EIA **verify the quality** of the data used in the HRW 2008 study?

Our Conclusions

As a result of our research, we have made the following conclusions:

- The datasets used in HRW's bathymetric analysis **are limited** and should not have been relied upon solely
- DHB's survey grid lines were too far apart to capture sufficient bathymetric data in order to **calculate volume changes accurately**
- DHB's bathymetric analysis of the Goodwin Sands was therefore **unable to fulfil** its intended purpose
- Changes in bank development were **not analysed** over the proposed **20 years**
- HRW's claim that bank levels recovered following previous extractions appears to be **unsubstantiated**
- The **cumulative impact** of the historical removal of **6.4 million m^3** of sand was **not assessed**
- Since the historic removal of 244,060 m^3 was the only extraction covered by the 2008 study the impact of removing **2.5 million m^3** of sand by DHB was **not assessed**

Our Conclusions continued

- A **calculated comparison** shows a **diminution** of intertidal areas between **1987 – 2005**
- The Goodwin Sands are **one dynamic complex** with aggregate extraction in one area having a potential **knock-on** effect elsewhere
- Although it is generally accepted that the Goodwin Sands are dynamic this **does not mean** the system **responds positively** to external pressures
- The inadequate bathymetric study could have led to a possible **threat to the stability** of the East Kent foreshore
- The impact of aggregate extraction on Protected Wrecks was **not addressed** by the bathymetric modelling

Our Recommendations

We would like to make the following recommendations for the statutory regulators when they are considering any bathymetric modelling for future aggregate extraction licences on the Goodwin Sands. This is to ensure that extracting industrial-scale quantities of sediment from the Sands does not cause increased beach erosion, unintended damage to Protected Wrecks and diminution of the intertidal areas.

- Data collected in a bathymetric survey should be of sufficient **high quality** agreed in advance with the regulators
- A bathymetric comparison of the **whole sandbank complex** should be carried out.
- **Changes** to intertidal areas over time should be **quantified** by digital mapping
- These comparisons should preferably cover a period of preferably **30 years** in order to characterise long-term trends and shifts in the overall sand system
- The **cumulative impact** of all historical extractions should be assessed
- The effect of aggregate extraction on **Protected Wrecks** should be addressed in the bathymetric modelling
- More **detailed examination** of studies made **on behalf** of developers is required
- **The Crown Estate**, as authorising agency and the **Environment Agency** as environmental regulator should satisfy themselves that EIA surveys are **fit for purpose**

Proposed initial circulation:

British Marine Aggregate Producers Association
Department for Culture, Media and Sport
Dover District Council
Canterbury City Council
Centre for Environment, Fisheries and Aquaculture Science
Channel Coast Observatory
Chartered Institute for Archaeologists
Dover Harbour Board
Environment Agency
Historic England
H R Wallingford
Joint Nautical Archaeology Policy Committee
Kent County Council
Kent & Essex Inshore Fisheries and Conservation Authority
Kent Wildlife Trust
Marine Management Organisation
MP for Deal and Dover
MP for North Thanet & Villages
Natural England
Professor Dave Parham
Professor Robert Duck
Royal Haskoning DHV
South East Coastal Group
The Crown Estate
UK Hydrographic Office
Walmer Town Council

Appendix A. UKHO charts of intertidal areas

The four charts below have been reproduced with permission of The Keeper of Public Records and the UK Hydrographic Office (www.GOV.uk/UKHO) © Crown Copyright.

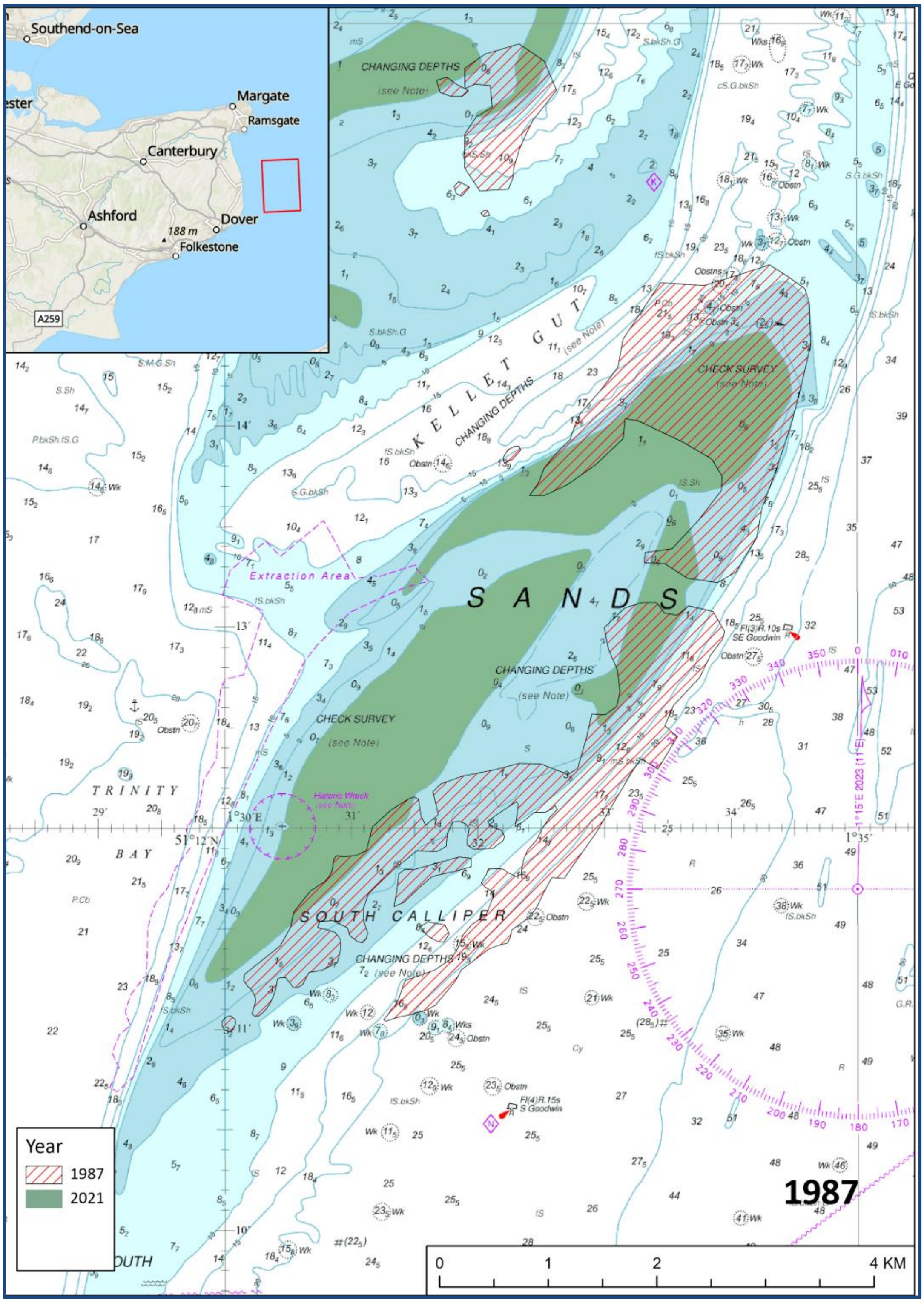

Figure 5. Intertidal areas 1987

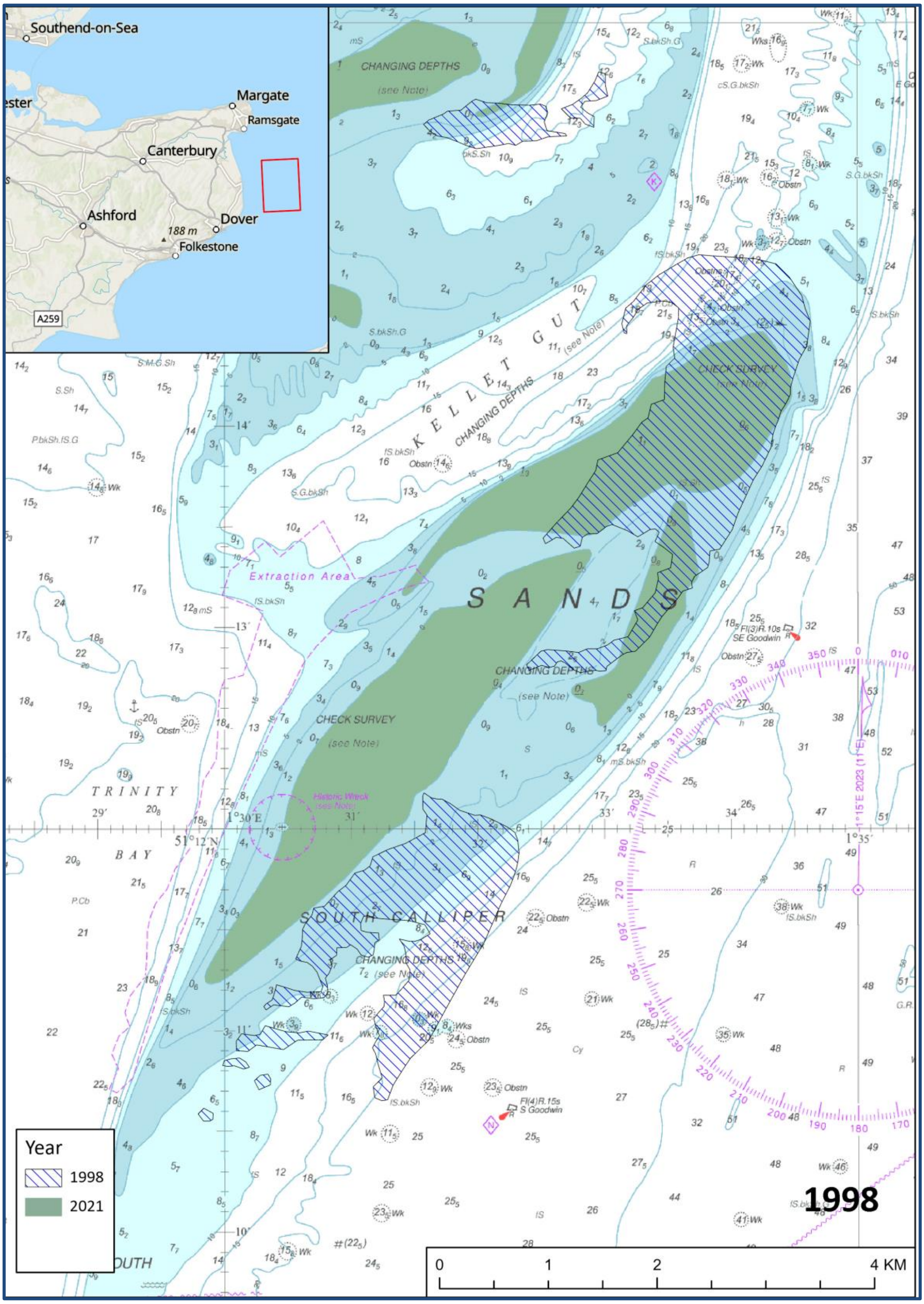

Figure 6. Intertidal areas 1998

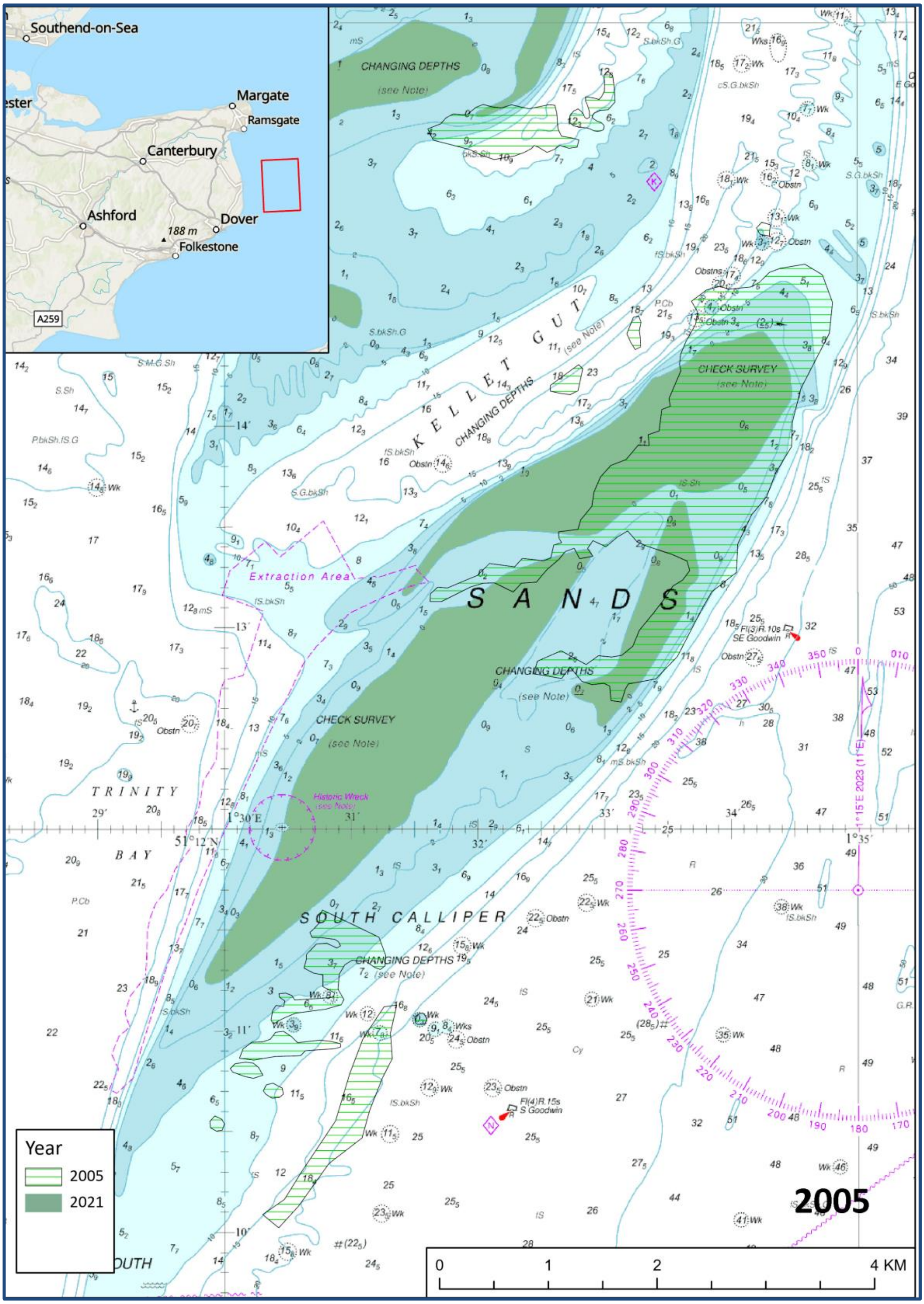

Figure 7. Intertidal areas 2005

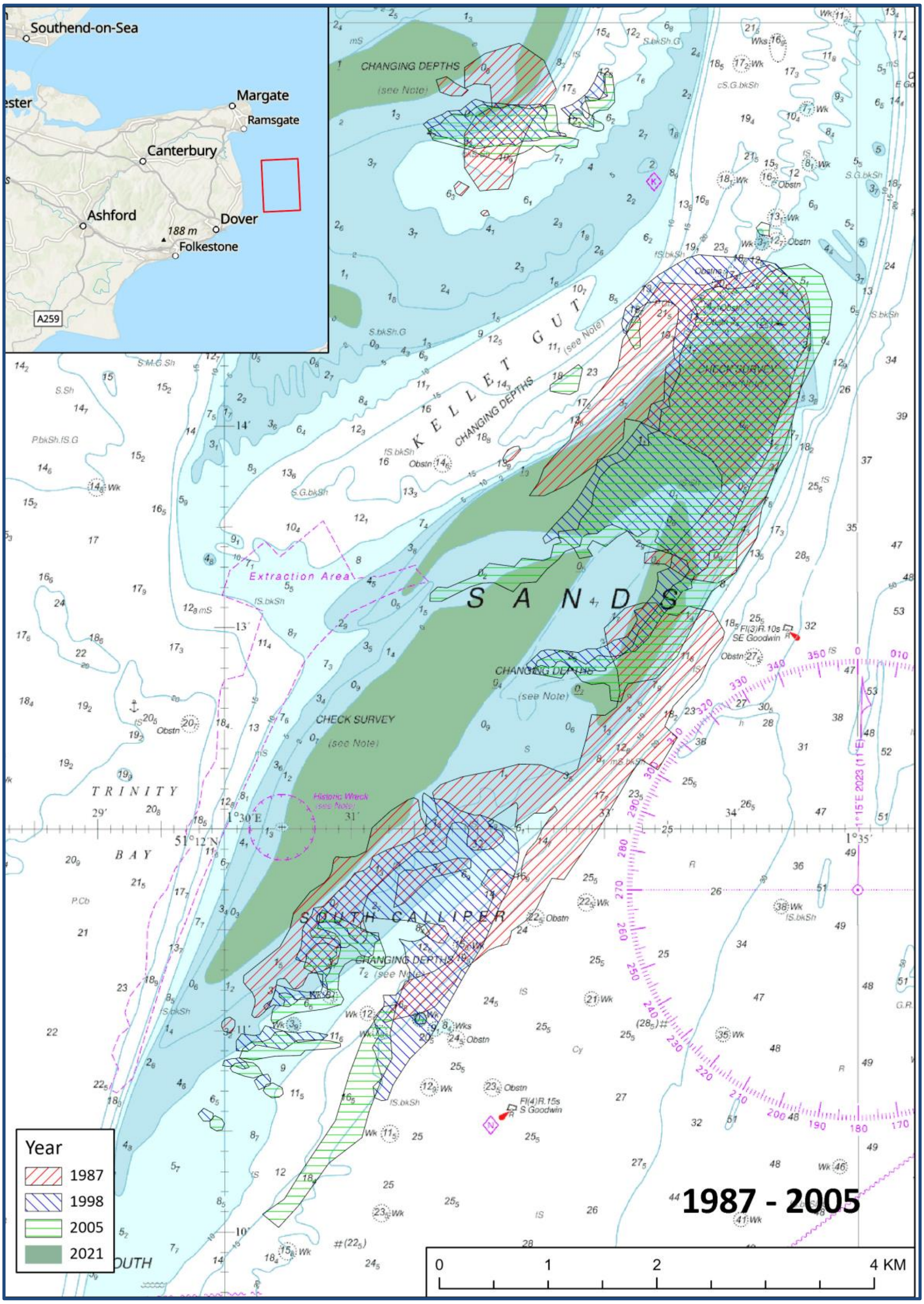

Figure 8. Intertidal areas 1987 - 2005