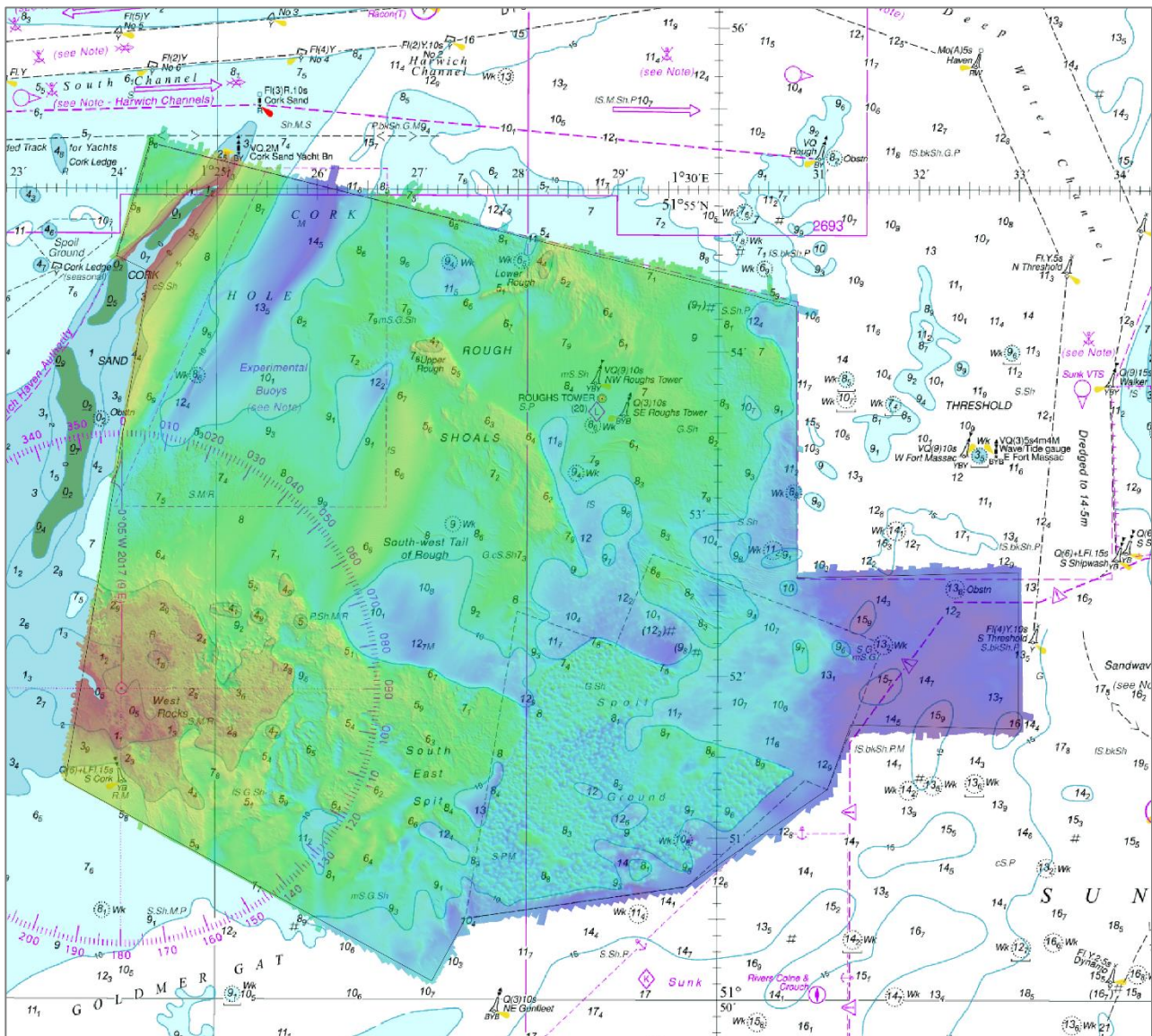




THAMES ESTUARY ROUGH SHOALS (TE8) ASSESSMENT TE8/2016-V3

An assessment of the 2016 hydrographic survey of the area TE8: to monitor recent seabed movement; to identify any implications for shipping; and to make recommendations for future surveys.



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ROUGH SHOALS TE8, 2016

1. EXECUTIVE SUMMARY

The Area and Recent Changes

- 1.1 Area TE8 was formally removed from the Routine Resurvey Programme in 1999 due to the area being monitored by Harwich Haven Authority.
- 1.2 TE8 lies to the south of the Harwich Deep Water Channel, north of Goldmer Gat, and west of Sunk and Harwich Deep Water Routes. It is bounded by Cork Sand and Cork Hole to the north west, and includes the main Harwich spoil ground north of the sunk Inner anchorage area.
- 1.3 The minimum depth in TE8 is 0.19m on Cork Sand bank in the northwest of the survey area.
- 1.4 AIS data indicates the largest draught of vessel to transit within TE8 was 16m close to Cork Sand. However, this tanker was unlikely to have had maximum draught when transiting the area. Some shipping with <10m draught transit through the eastern part of TE8 to use the spoil ground and anchorage to the south.
- 1.5 Sandwaves up to 2.5m high are found in the eastern part of the survey area.

Reasons for Continuing to Resurvey the Area

- 1.6 The lack of depth change since 1998 suggests that depths in this area are of low concern to shipping.

Recommendations

- 1.7 It is recommended that the area be removed from the RRS Programme.

2. INTRODUCTION

- 2.1 This Assessment is produced by the United Kingdom Hydrographic Office (UKHO) for the Maritime and Coastguard Agency (MCA).
- 2.2 Analysis of the Routine Resurvey Areas forms part of the Civil Hydrography Programme and the reports are made available to all interested parties through the UKHO website and are presented to the Civil Hydrography Working Group. When approved, the recommendations are incorporated into the Routine Resurvey Programme.
- 2.3 The Admiralty Chart extracts, other graphics and tables in this Report are included for illustrative purposes only and are NOT TO BE USED FOR NAVIGATION.
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3. AREA HISTORY

3.1 Summary of Surveys:

Year	Survey	Reference	Data	Year	Survey	Reference	Data
1981	K8861	H1941/80	s.t.	1998	Harwich Deep Water Channel	2006-358335	s.
1987	K1121	H4021/86	s.t.	2014	Harwich Cork Sand	2014-227555	s.
1994	M2341	HH090/575/01	s.t.d.	2016	HI1522	2016-181430	m.

Key: s = sonar sweep, t = seabed texture tracing, d = digital data, m = multibeam digital data
Single-beam surveys 1998 and 2014 undertaken by third parties and not under the auspices of the CHP.

3.2 Summary of historical recommendation enacted

Year	Remarks
1980	Area 8 established. Part of old area C and E (H3911/80)
1992	HI575 – Amendments to HHA limits survey delayed due top capital dredge dumping (HH090/575/01)
1993	HHA limits extended: BA NM 3018/93 (HH242/470/02)
1996	HHA survey – HHCB 33(3) Rough Tower Spoil Ground
1998	Area taken over by HHA
1999	Changed to assessments only and area removed from the Routine Resurvey Programme due to the area being monitored by Harwich Haven Authority

4. DESCRIPTION OF THE AREA

- 4.1 Area TE8 lies to the south of the Harwich Deep Water Channel, which is the approach channel to Harwich. TE8 includes the main Harwich spoil ground north of the sunk Inner anchorage area. It is bounded by Cork Sand and Cork Hole to the north west and by Goldmer Gat to the south. The area lies to the west of two recommended deep water tracks: 1) Sunk Deep Water, which is used by deep draught vessels as an approach to Black Deep and onwards into the Thames Estuary, and 2) Harwich Deep Water, leading to the Harwich Deep Water Channel, which has a maintained depth of 14.5m.
- 4.2 The shoalest depth is 0.19m on Cork Sand bank in the northwest of TE8. Next to Cork Sand is the deep Cork Hole, containing a charted area of Experimental Buoys. The southwest of TE8 contains a shoal rocky area called West Rocks, with depths as low as 0.5m. In the north and centre of TE8 is Rough Shoals, containing shoal patches of sand and rock as shallow as 4.4m. In the southeast of TE8 is a charted spoil ground.
- 4.3 Ripples and sandwaves are found throughout Rough Shoals. Sandwaves up to 2.5m are found in the eastern part of the survey area.
- 4.4 Area Covered: 18.9 NM² (65 km²) as shown in Figure 1 below.

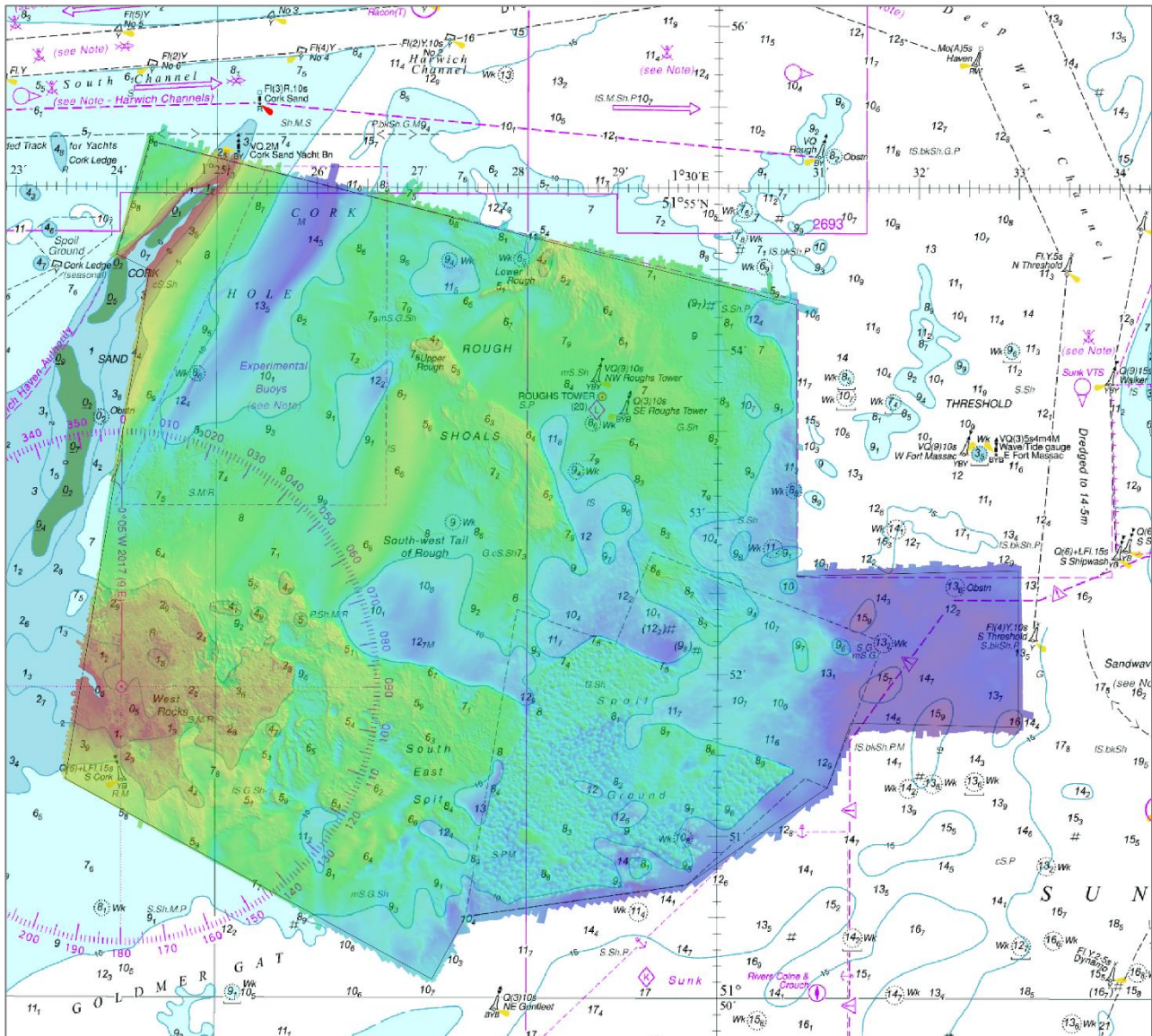


Figure 1 – 2016 survey data sun-illuminated view overlaid on BA Chart 2052

4.5 The geographic limits at the time of resurvey are shown in the Table 1 below and coordinates are in Decimal Degrees referenced to WGS84:

Table 1: Survey Limits for HI1522 TE8 Survey Area

Point	Latitude (N)	Longitude (E)
01	51.85573	1.39187
02	51.90807	1.40553
03	51.90972	1.40005
04	51.92135	1.40553
05	51.90466	1.51303
06	51.87675	1.51306
07	51.87733	1.55001
08	51.86123	1.55000
09	51.86167	1.52217
10	51.85500	1.51833
11	51.84500	1.49500

12	51.84167	1.45833
13	51.83523	1.45275
01	51.85573	1.39187

4.6 Survey interval at time of resurvey: Not applicable

4.7 Largest scale chart: BA2052 (Scale 1:50,000)

5. SHIPPING IN THE AREA

5.1 Shipping data from satellite AIS data for 2016 of vessels larger than 2000GT shows the vessel with the largest draught to transit through the TE8 survey area was a tanker with a registered draught of 16m close to Cork Sand. However, this tanker may not have been fully loaded and therefore may have had a smaller draught when transiting the area.

5.2 Figure 2 shows that vessels with the largest draughts follow the recommended Sunk and Harwich deep water tracks close to the eastern edge of TE8 and the Harwich Deep Water Channel to the north of TE8. Shipping with <10m draught also follow these tracks as well as through the eastern part of TE8 to use the spoil ground and the anchorage area to the south.

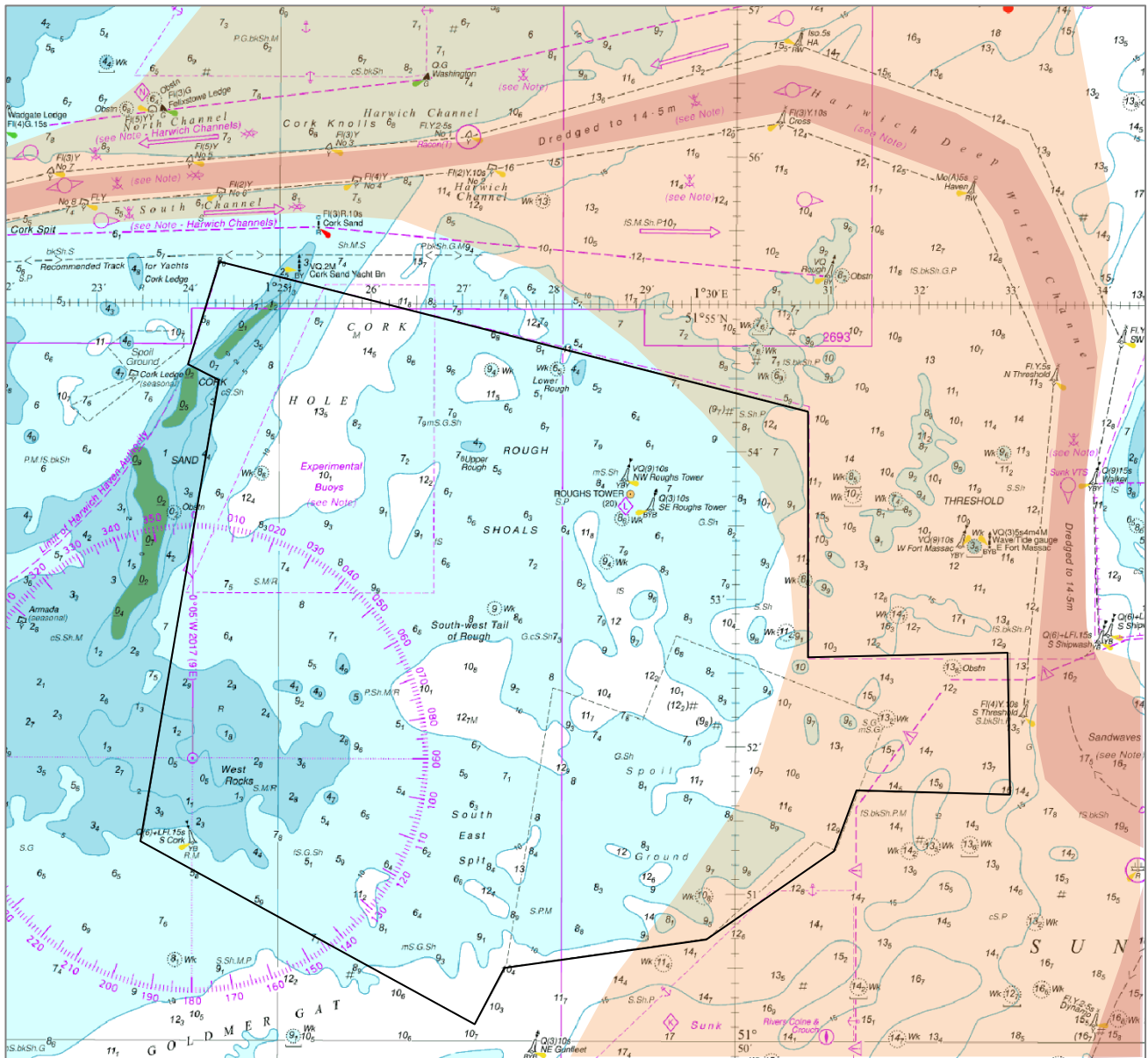
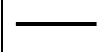




Figure 2 – Indicative shipping routes overlaid on BA Chart 2052

	Limits of survey Area
	Indicative shipping routes of vessels with <10m draught
	Indicative shipping routes of vessels with 10-20m draught

6. REFERENCE SURVEY DETAIL

- 6.1 The historical survey gathered for the eastern part of TE8, which has been used to compile this assessment, is 2006-358335 Harwich Deep Water Channel gathered between 19th May and 28th August 1998 by Harwich Haven Authority.
- 6.2 The survey data was acquired using a single beam echosounder system with an approximate line spacing of 100m and crosslines of 1000m. The survey is referred to the World Geodetic System 1984 datum. Depths were reduced to Chart Datum.

- 6.3 The historical survey gathered for the western part of TE8 which have been used to compile this assessment is 2014-227555 Harwich Cork Sand gathered between 28th April and 3rd July 2014 by Harwich Haven Authority.
- 6.4 The survey data was acquired using a single beam echosounder system with an approximate line spacing of 100m and crosslines of 1850m. Positioning was achieved using RTK GPS. The survey is referred to the World Geodetic System 1984 datum. Depths were reduced to Chart Datum using observations from the automatic tide gauge at Wadgate Ledge Beacon and Walton Pier.
- 6.5 Given the lower density of soundings available in both the surveys dated 1998 and 2014 compared to the comparison survey it will be necessary to undertake linear interpolation between soundings. This reduced resolution will limit the detail in later sections of this report.
- 6.6 The validated bathymetric surfaces are available to download from INSPIRE portal and MEDIN Bathymetry Data Archive Centre. However, the Report of Survey for these surveys is unavailable.

7. COMPARISON SURVEY DETAIL

- 7.1 The latest survey undertaken as part of the Routine Resurvey element of the Civil Hydrography Programme (CHP) was in 2016 under Hydrographic Instruction (HI) 1522. Area TE8 was surveyed between 10th and 16th September, and between 22nd and 23rd September. Between 16th and 21st September were dates where survey operations were suspended due to weather conditions.
- 7.2 The survey data was acquired using multibeam echosounder system. The primary reference position system used GNSS and was supplemented by a dynamic GNSS Precise Point measuring system. The survey is referred to the European Terrestrial Reference Frame 1989 (ETRF89) datum.
- 7.3 Observations from GNSS 3D positioning were combined with the UKHO Vertical Offshore Reference Frame (VORF) to reduce depths to Chart Datum. The final deliverable was a 1m resolution CUBE (Combined Uncertainty and Bathymetry Estimator) surface.
- 7.4 The survey was validated by UKHO and met IHO S44 (5th Edition) Order 1a standards.
- 7.5 The Report of Survey for this survey is available upon request from the UKHO and the validated bathymetric surfaces are available to download from INSPIRE portal and MEDIN Bathymetry Data Archive Centre.

8. DESCRIPTION OF RECENT BATHYMETRIC CHANGE

- 8.1 The Variability Plot in Figure 3 shows that in the eastern part of TE8 there has been a varied change in in water depth since 1998. The greatest depth change has been over the spoil ground in the southeast of TE8, which has shoaled by up to 8.3m between 1998 and 2016 to a minimum depth of 7.4m.
- 8.2 In the Rough Shoals area in the north of TE8 the largest shoaling has taken place over a wreck north of Lower Rough, which has shoaled from 10.5m in 1998 to 6.5m in 2016. The minimum depth over Rough Shoals in 2016 was 4.4m, which has shoaled by 0.1m since 1998.
- 8.3 The west of South East Spit has shoaled by up to 4.2m, from 9.8m in 1998 to 5.6m in 2016. However, no vessels are indicated in the AIS data available to transit here or close to this area

8.4 Ripples and sandwaves are found throughout Rough Shoals. Sandwaves up to 2.5m are found in the eastern part of the survey area. It is uncertain to how these have changed since the 1998 survey due to resolution of this reference data.

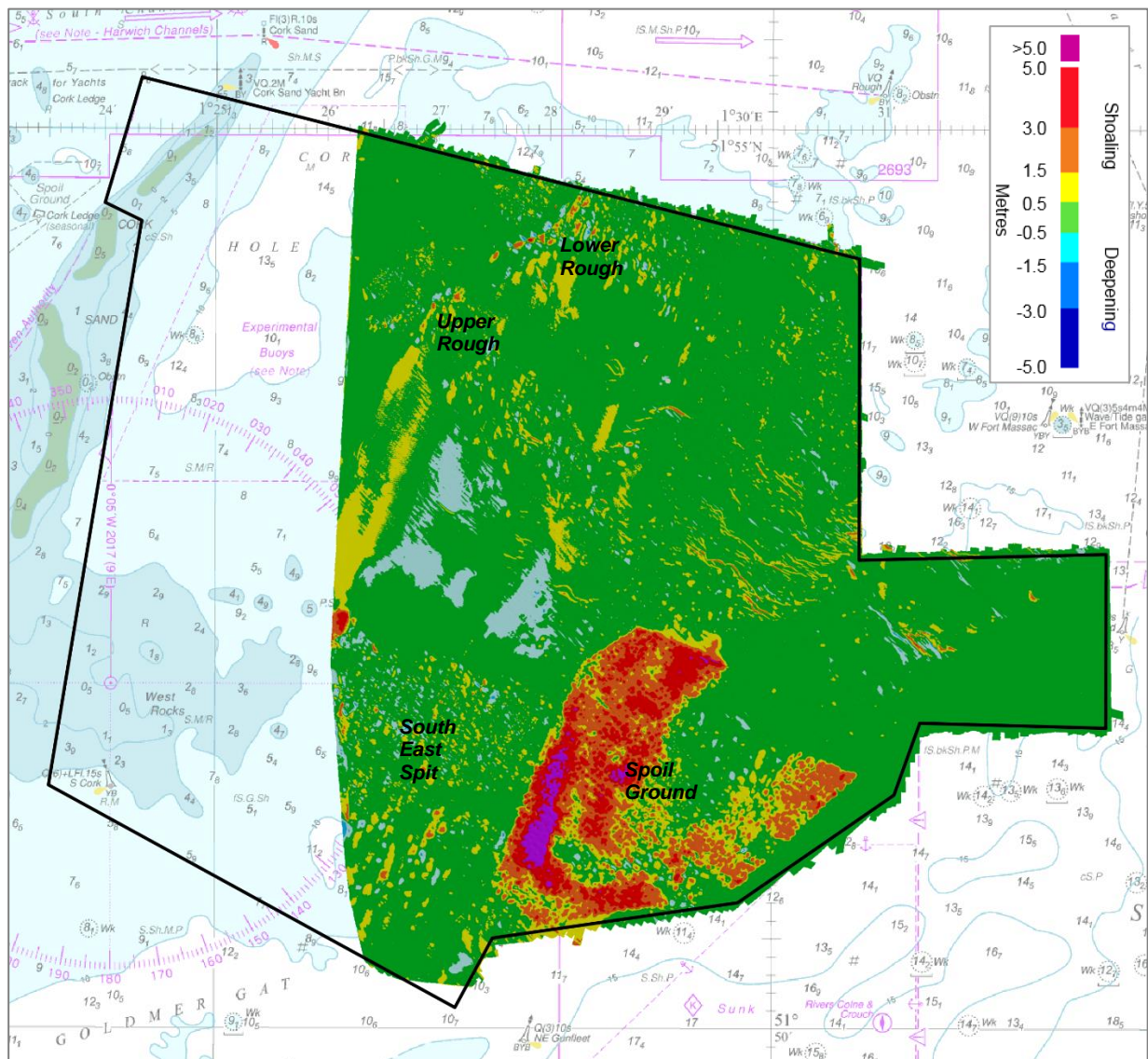


Figure 3 – Variability Plot of bathymetric change between the 1998 and 2016 surveys in the eastern part of TE8

8.5 The Variability Plot in Figure 4 shows bathymetric change in the western part of TE8 since 2014. The shoalest depth in TE8 is 0.19m on Cork Sand bank in the northwest of TE8. However, it is inconclusive whether there is sediment migration over Cork Sand towards the Harwich Deep Water Channel and charted Recommended Track for Yachts due to the resolution of the reference data over this part of the survey area.

8.6 The shoal rocky area of West Rocks in the southwest of TE8 has a minimum depth of 0.5m, however no vessels are indicated in the AIS data available to transit here.

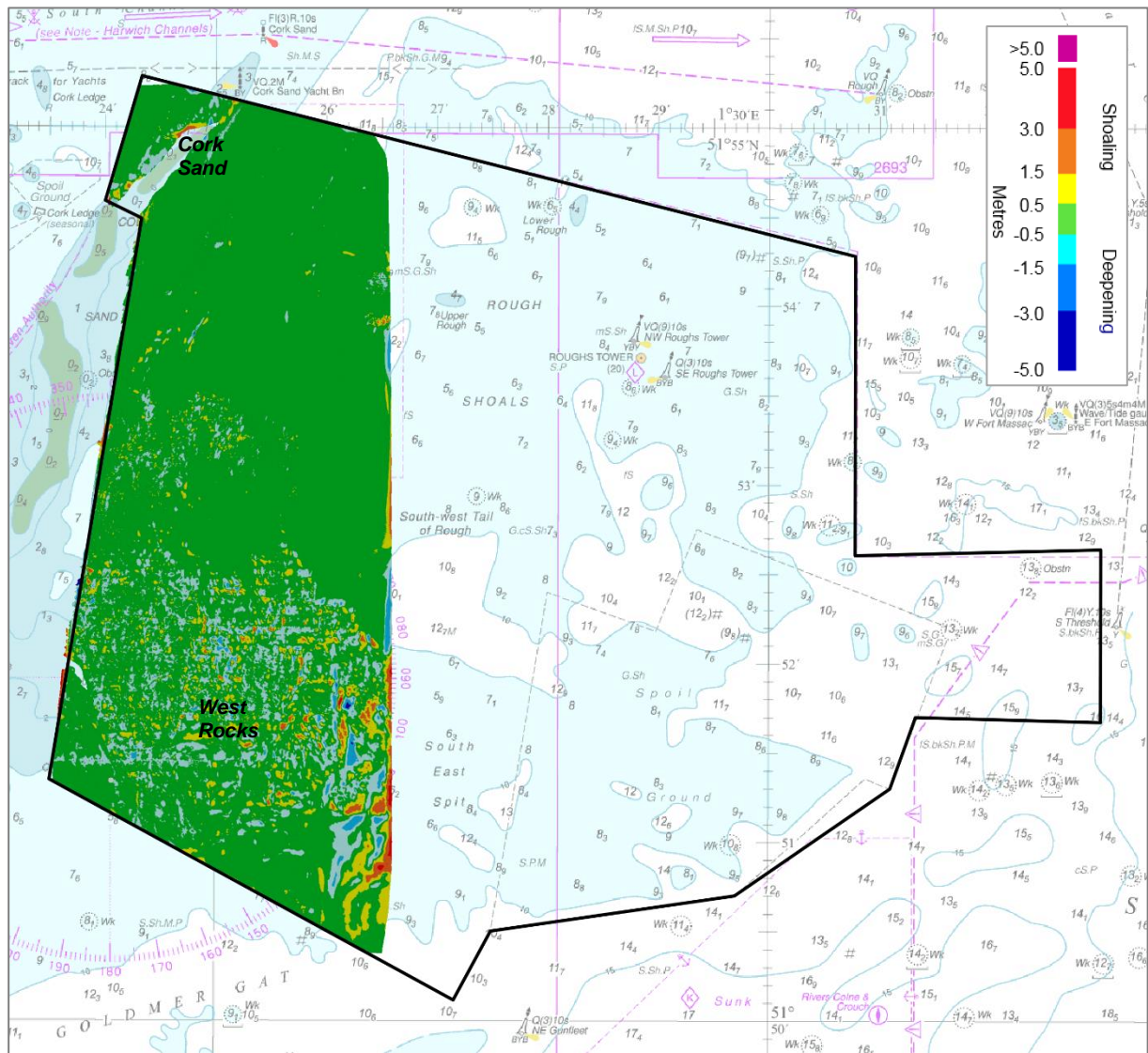


Figure 4 – Variability Plot of bathymetric change between the 2014 and 2016 surveys in the western part of TE8

9. IMPLICATIONS FOR SHIPPING

- 9.1 There is limited shipping activity indicated in the available AIS data within TE8 compared to the Deep Water routes to the east and north of the survey area. Some shipping with <10m draught transit through the eastern part of TE8 to use the spoil ground and the anchorage area to the south. Depths across this part of the survey area are deeper than the draught of shipping observed using the area. The lack of depth change since 1998 in the eastern part of the survey area suggests that depths in this area are of low concern to shipping, however this is uncertain due to the low resolution of the reference data. Another full density survey is required to confirm this.
- 9.1 Analysis of sediment movement over Cork Sand is inconclusive. Movement of sediment towards the Harwich Deep Water Channel would be of a concern to shipping in this area.

10. RECOMMENDATIONS FOR FUTURE SURVEYS

10.1 Due to the lack of vessel activity and minor changes in seabed over most of the area contained within TE8 the area should not be included in the RRS Programme.