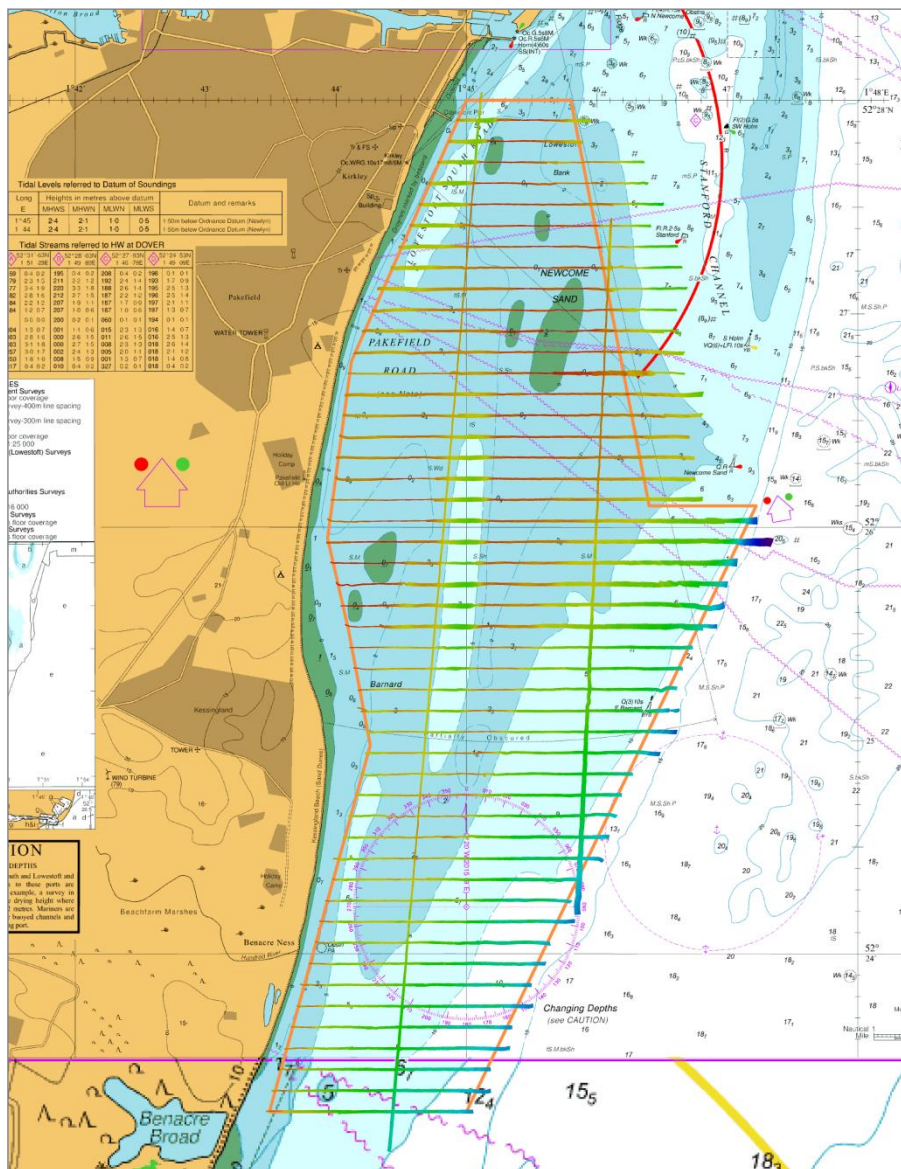




EAST ANGLIA PAKEFIELD ROAD

ASSESSMENT ON THE ANALYSIS OF ROUTINE RESURVEY AREA EA12 FROM THE 2014 SURVEY



ENGLAND - EAST ANGLIA

PAKEFIELD ROAD

Assessment EA12/2014

An assessment of the 2014 hydrographic survey of the area: to monitor recent seabed movement; to identify any implications for shipping; and to make recommendations for future surveys.

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PAKEFIELD ROAD, 2014

1. EXECUTIVE SUMMARY

The Area and Recent Changes

- 1.1 In 2004 the area of EA12 was extended northwards when part of EA10 was transferred to the area; this area did not require resurveying in 2004 as it had been recently surveyed under area EA10 in 2002. EA12 covers an inshore area between Benacre Ness and Lowestoft, and is only accessible to shallow draught vessels.
- 1.2 Most of the area consists of shoal banks with isolated deeps. The area, generally provides only around 2 metres of water at chart datum, is used by fishing and leisure craft and occasional small draught coastal traffic. The main merchant traffic passes to the east of the area.
- 1.3 The general features of the area remain, but have undergone notable change. An area of deep water east of Barnard has deepened and extended northwards. Either side of this the banks have continued to become shoaler. Changes in contours and variability plots indicate a net northerly sediment transport in the vicinity.
- 1.4 Shoaling either side of the deep off Barnard further restricts safe navigation in the area for all but the shallowest of craft. The seaward side of the bank has receded westwards away from East Barnard and Newcome Sand Buoys opposite to that last reported.
- 1.5 The 10 metre contour defining the seaward face of the banks in the vicinity of East Barnard light buoy has remained broadly in same position as that shown in 2004 however south toward the Benacre Ness the contour is receding towards the shoreline. The 5 metre contour shows more varied change due to the general shift of material northwards, with both retreat and expansion.

Reasons for Continuing to Resurvey the Area

- 1.6 The banks of Newcome Sand form the western limit of Stanford Channel and are subject to ongoing change in both their height and position. Sandwaves migrating northwards through Pakefield Road and Lowestoft South Road have the potential to affect the limits of the buoyed channel and positions of cardinal buoys. Given these conditions, the area requires inclusion in the routine resurvey program to ensure the chart reflects the changes.

Recommendations

- 1.7 Due to seabed mobility, the area should remain as part of the routine resurvey programme. A resurvey interval of 10 years is considered appropriate given the nature of craft using the area.
- 1.8 The area should be surveyed as open spaced lines, as conducted in the 2014 survey.
- 1.9 The limits of EA12 should have minor amendments as described in Annex L and an area in the vicinity of Newcome Sand light buoy transferred to Area EA10.

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 members of the Committee On Shipping Hydrography (COSH) through the UKHO website, before being presented to the Civil Hydrography Working

Group. When approved, the recommendations are incorporated into the Routine Resurvey Programme. The report is governed by a Memorandum of Understanding between the Department for Transport (including the MCA) and the MOD (including the UKHO).

3. HISTORY

- 3.1 EA12 is one of the routine resurvey areas of the East Anglian Routine Resurvey Programme and covers an area of generally shoal water to the south of Lowestoft.
- 3.2 Prior to 1980 the area that includes EA12 was designated Areas A and B. These covered an area extending from Holm Sand in the north via Pakefield Road to Barnard in the south.
- 3.3 In 1980 areas A and B were reorganised with changed limits and given the identifiers C1 and C3. These had a 1 and 3 year survey interval respectively.
- 3.4 The 1994 report on C1 and C3 radically altered the limits, removing C3 from the programme, although parts of C3 were subsumed within other areas. It was recommended that a review of the C3 survey area take place 12 years from the date of the report.
- 3.5 Following assessment of the 2001 survey for EA10, the area limits were revised to better focus on areas of concern to shipping. The southwest part of the area was transferred to EA12, and the southern limit was extended to take account of sediment transport along Newcome Sand.
- 3.6 The 2004 survey of area EA12 determined the requirement and the frequency for resurvey. The northern portion transferred from EA10 was surveyed in 2001 and hence it was not considered necessary to resurvey the area in 2004.
- 3.7 Following the first assessment of area EA12 revised limits undertaken in 2004 the limits were again revised. The eastern limits adjusted to remove deep water and the southern limit extended to better encompass the southern end of the shoal and potentially mobile seabed.
- 3.8 Area history and specifications are at Annex A.

4. DESCRIPTION OF THE AREA

- 4.1 EA12 extends northwards from Benacre Broad, covering Barnard, Pakefield Road, Lowestoft South Road and Newcome Sand. The Roads have provided a buoyed approach route to Lowestoft in the past, but the inshore route is no longer buoyed, is ill defined and includes areas of shoal water. The limits of area EA12 cover an area of 5.8 SQ NM (19.8 SQ KM).

5. SHIPPING IN THE AREA

- 5.1 Pakefield Road and Lowestoft South Road provide an unbuoyed inshore route close along the coast for shallow draught vessels. The area is understood to be used by local fishing vessels, leisure craft and some occasional small draught coastal traffic, with the main merchant traffic bound for Lowestoft keeping east of the area before entering the buoyed Stanford Channel. In the past this area has provided a buoyed approach to Lowestoft from the south, but the buoyed approach is now through Stanford Channel to the northeast of area EA12.
- 5.2 Shipping data for the months of January, March, July and October 2012 was examined and the data summarised in the illustration shown in Annex B. Most of the vessels approach Stanford Channel from the south and pass close to Newcome Sand light buoy.
- 5.3 It has not been possible to establish the maximum size or draught of vessels that use the unbuoyed inshore area.

6. 2004 SURVEY DETAILS

- 6.1 The survey was conducted between 30th May and 16th July. The majority of the survey area was completed by 9th June, with a single survey line run on 16th July to complete the outer (eastern) limit of the survey. During the survey the weather remained good with only occasional interruptions.
- 6.2 The area was surveyed using a combination of multibeam and singlebeam echosounders. A 1,000m north/south corridor covering an inshore channel was surveyed by mv Confidante using an EM3000D multibeam, while singlebeam sounding of the whole area was conducted using a Rigid Inflatable Boat.

Multibeam

- 6.3 The multibeam section of this survey was conducted using a dual head Kongsberg Maritime EM3000D multibeam echosounder. The survey line spacing and the use of sidescan sonar provided full insonification used to satisfy object detection requirements and achieve a survey standard of IHO Order 1.
- 6.4 Positioning was by DGPS and the survey referred to the International Terrestrial Reference Framework 2000 (ITRF2000) Datum.

Singlebeam

- 6.5 The single beam section of this survey was conducted using a Ceeducer, a Differential Beacon capable portable sounding system. Survey lines were run at 150 metre intervals, in the direction of 90°/270°. Multibeam survey lines were at 90° enabling their use as cross lines to check data quality. The survey achieved IHO Order 2 standard.
- 6.6 There is a vertical offset between the singlebeam and multibeam data. The multibeam data is up to 0.7 metres shoaler than the singlebeam data, although it was not possible to establish the cause of this offset.
- 6.7 The location of cross sections comparing the 2002/2004 survey with that undertaken in 2014 in area EA12 is presented in Annex D and the cross sections shown at Annex E.

7. 2014 SURVEY DETAILS

- 7.1 The survey for area EA12 was conducted from 26th July until the 1st August using EGS vessel Wessex Explorer and 13th to the 14th September using EGS vessel Echo as part of HI1458. The area was surveyed using wide line spacing MBES with a SBES in shoaler water. The weather experienced in the area was noted as being generally slight to moderate sea state with wind stated as being NE 4-5, Beaufort scale. It should be noted that significant weather down time was experienced during the routine resurvey survey operations for East Anglia (HI1458).

Total (12 hs Days)	Survey Operations (hh:mm)	Transit (hh:mm)	Weather Standby (hh:mm)	Other (hh:mm)	Mobilisation / Demobilisation (hh:mm)
60.34	266:56	73:48	351:51	31:30	00:00

Table 1: Summary of Wessex Explorer survey operations for HI1458

Total (Days)	Survey Operations (hh:mm)	Transit (hh:mm)	Weather Standby (hh:mm)	Other (hh:mm)	Mobilisation / Demobilisation (hh:mm)
1.62	10:01	02:43	00:00	00:00	06:40

Table 2: Summary of Echo survey operations for HI1458

- 7.2 Survey data was acquired using the Wessex Explorer hull mounted Kongsberg EM3002D multibeam echosounder and infill operations over the shoalest area was conducted by the EGS vessel Echo using a Teledyne Odom Hydrotrack singlebeam echosounder. Observations calculated from the height component of the GPS position solution were used to reduce soundings to Chart Datum. Ellipsoidal Height to Chart Datum values were taken from the Vertical Offshore Reference Framework (VORF).
- 7.3 The 2014 survey data overlaid on chart BA1535 is presented in Annex C.

8. DESCRIPTION OF RECENT BATHYMETRIC CHANGE

- 8.1 HI1458 undertaken in 2014 was the first concurrent survey of area EA12, as defined in 2004. To maximise the area covered in this assessment it was necessary to combine historical survey data sets from both 2002 and 2004. For this reason the Profiles and Variability plot presented in Annex E and H respectively have been based on a generalised and interpolated surface. However, the colour banded depth plots in Annex F and G are based on the shoalest valid soundings and no interpolation was undertaken to produce these depths.
- 8.2 Colour banded depth plots of the 2002/2004 and 2014 surveys are at Annexes F and G. A variability plot showing depth differences between the 2002/2004 and 2014 surveys is at Annex H. Contour comparison plots of the 3, 5 and 10 metre contours are at Annexes I, J and K respectively.
- 8.3 The general features of the area remain, but have undergone notable change. An area of deep water east of Barnard has deepened and transposed northwards, as show in the changes to the 5 metre contour at Annex J. Either side of this the banks have continued to become shoaler. For example, 1.8m sounding shown in Annex G demonstrates a derived shoaling of 4.5 metres.
- 8.4 Shoaling either side of the deep off Barnard further restricts safe navigation in the area for all but the shallowest of craft. The seaward side of the bank has receded westwards away from East Barnard and Newcome Sand Buoys opposite to that last reported.
- 8.5 Changes in both the 3 and 5 metre contour and variability plots presented in Annex I, J and H respectively indicate a net northerly sediment transport in the vicinity of Barnard and is resulting in steeper bank gradients in charted depths of less than 5 metres.
- 8.6 The area between Barnard, west of the deep water, and through Pakefield Road has continued to shoal considerably and the 3 metre contour extended northwards.
- 8.7 The 5 metre contour shows more varied change due to the general shift of material northwards, with both retreat and expansion.
- 8.8 The depths have notably shoaled in the vicinity of Lowestoft Bank and channel of Lowestoft South Road from 4.3 metres to 0.4 metres drying.
- 8.9 The area immediately adjacent to the coast between Benacre Ness and Lowestoft has previously been identified as having a northerly ebb residual current and this appears to still be the case.

8.10 The 10 metre contour defining the seaward face of the banks in the vicinity of East Barnard light buoy has remained broadly in same position as that shown in 2004. However, south toward the Benacre Ness the contour has receded towards the shoreline by 350 metres and towards Newcome Sand light buoy the contour advanced seaward by 150 metres.

9. IMPLICATIONS FOR SHIPPING

9.1 The inshore area can only be used by shallow draught vessels with local knowledge and generally provides less than 2 metres of water at Chart Datum, with a further 2.1 metres available on a mean high water neap tide. Shoaling that has occurred either side of the deep water off Barnard further restricts safe navigation in the area for all but the shallowest of craft. The chart cautions that “southerly gales may reduce the charted depths in Pakefield Road by up to one metre”.

9.2 The seaward side of the bank has since receded westwards caused by an overall movement of material northwards. This has resulted in an increased depth for shipping from the bank of Newcome Sand to the Southeast towards East Barnard light buoy, albeit in close vicinity of East Barnard light buoy, looking seaward and north to Newcome Sand light buoy there is evidence of shoaling of up 4 metres since 2004.

10. RECOMMENDATIONS FOR FUTURE SURVEYS

10.1 The shallow draught of vessels using the area and the chart caution regarding changeable depths in the area justify maintaining the current resurvey schedule of the area.

10.2 The sediments in the area are mobile and this may impact on use of the area, either limiting access or conversely opening up the area to larger vessels justify maintaining this area as part of the Routine Resurvey Program using the wide line spacing MBES survey techniques used in 2014.

10.3 Due to shoaling, the area of Lowestoft South Road and Lowestoft Bank is to be resurveyed in 2015 with a combination of 150 metre spaced check-lines and full survey of Lowestoft South Road. Following this it is recommended the resurvey interval be reviewed.

10.4 Proposed new limits of EA12 are shown in Annex L and are a result of the following:

- The transfer of the area in the vicinity of Newcome Sands light buoy to EA10 to more frequent resurvey schedule.
- Adjusts the boundary of EA12 in to the current area of EA10 to the obscured sector line shown on Chart BA1535.

10.5 Due to shoaling and use by low density shipping the following area limits should be transferred to EA10 to allow a resurvey schedule of 3 years. The area has been enlarged to enable the 10 metre contour to be captured assuming it progresses seaward at a similar rate as described in paragraph 8.10.

- a) 52°26.10 N 1°46.54 E
- b) 52°26.11 N 1°47.35 E
- c) 52°25.51 N 1°46.76 E

AREA SPECIFICATIONS
(Including Survey History)

REGION: East Anglia**NAME:** Pakefield Road**AREA:** EA12**LIMITS:**

- a) 52°23.26 N 1°43.49 E
- b) 52°24.98 N 1°44.26 E
- c) 52°25.52 N 1°44.09 E
- d) 52°25.95 N 1°43.94 E
- e) 52°26.78 N 1°44.12 E
- f) 52°28.00 N 1°45.00 E
- g) 52°28.00 N 1°45.80 E
- h) 52°26.10 N 1°46.40 E
- i) 52°26.10 N 1°47.22 E
- j) 52°23.26 N 1°45.00 E

Area co-ordinates are referred to WGS84

AREA SIZE: 5.8 NM² (19.8 KM²) Approx.**SURVEY INTERVAL:** 10 Year**SURVEYS:** (conducted at 1:25,000 scale (not applicable to multibeam surveys))

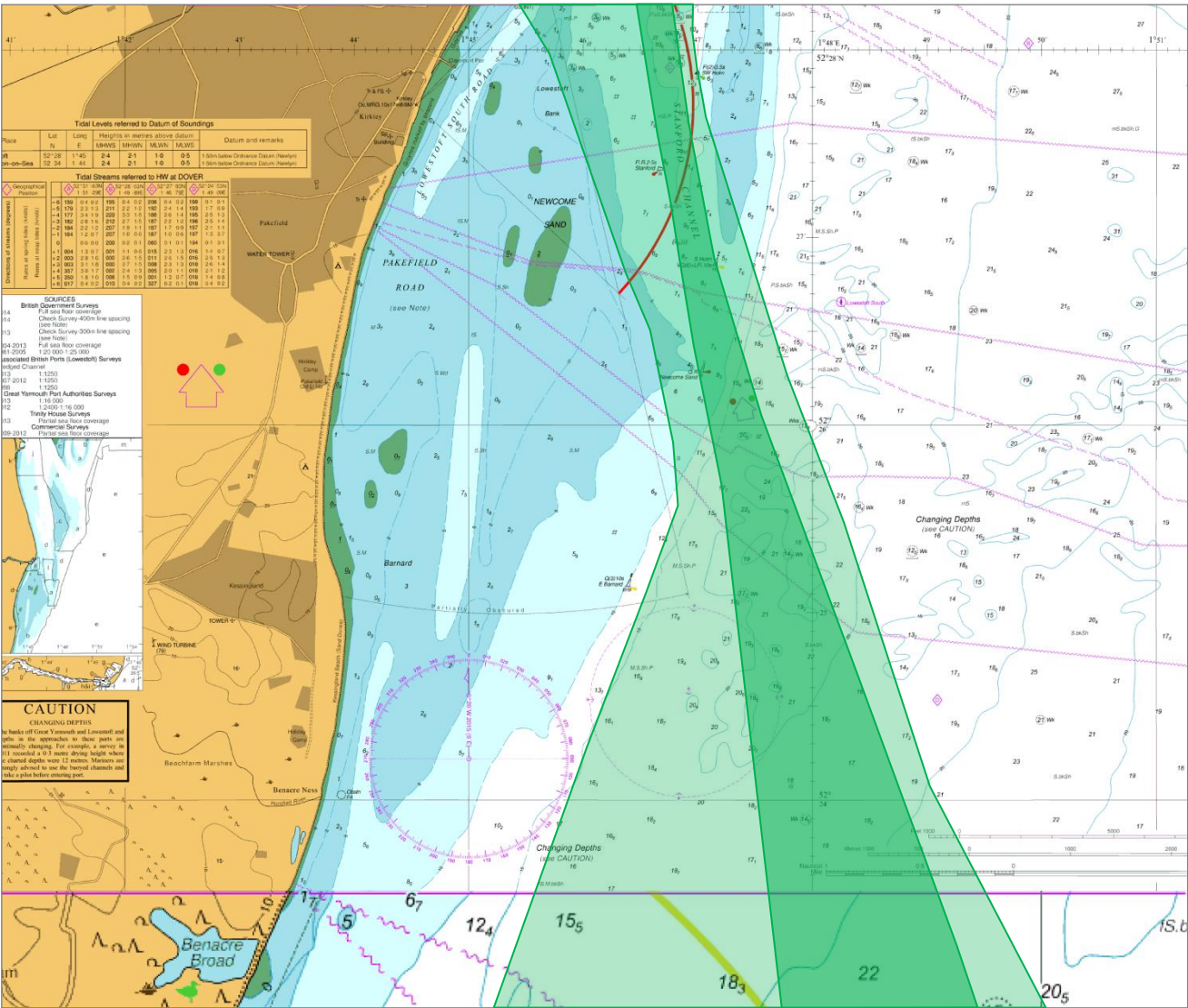
Year	Survey	File Ref	Data
1995	M2481	HH090/663/01	d
2001	HI999	HH090/999/01	d
2004	M4171	HH091/077/01	d
2014	HI1458	2014-142852	m

KEY: d = digital data, m = multibeam digital data**ASSESSMENTS:** 1995 M2481 (HA145/02/003/05)

REMARKS: 2002 Area limits extended following transfer from EA10 and extension of southern limit to include area of sediment transport
2004 Northern area of EA12 not surveyed, limits revised to remove deepwater and extended to over shoal and mobile seabed areas

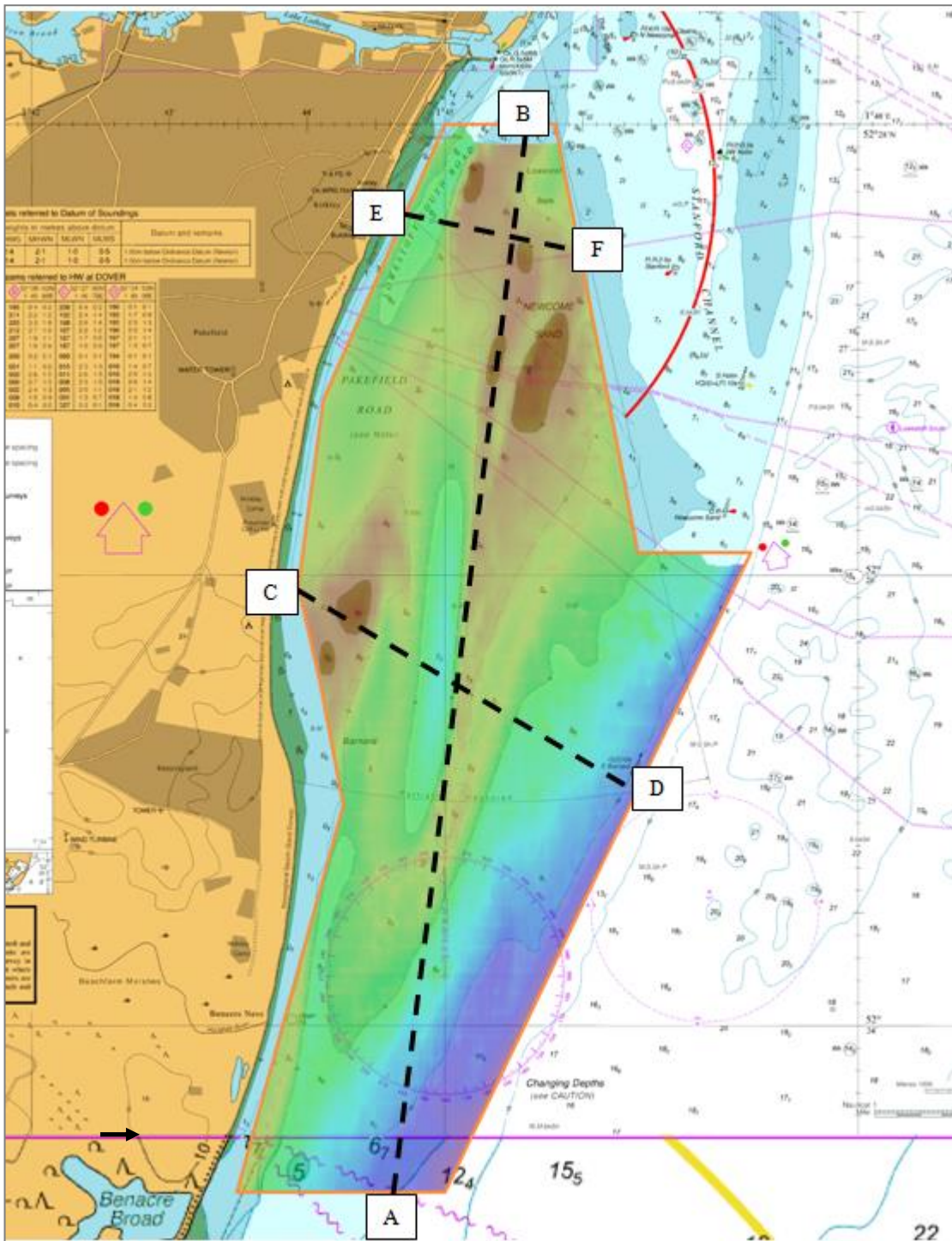
LARGEST SCALE CHART: BA1535 (INT1559) at 1:25,000)

SHIPPING ROUTES



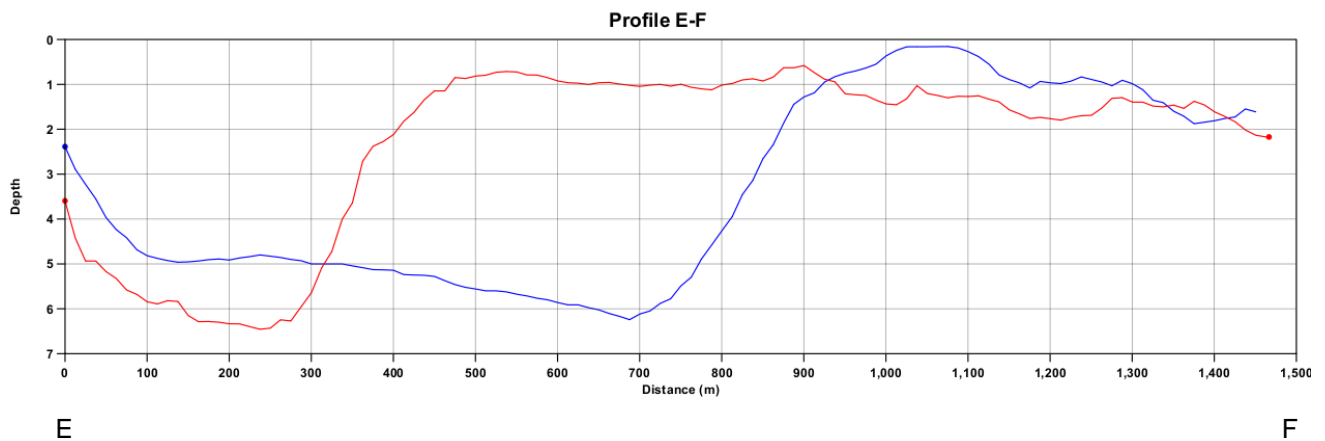
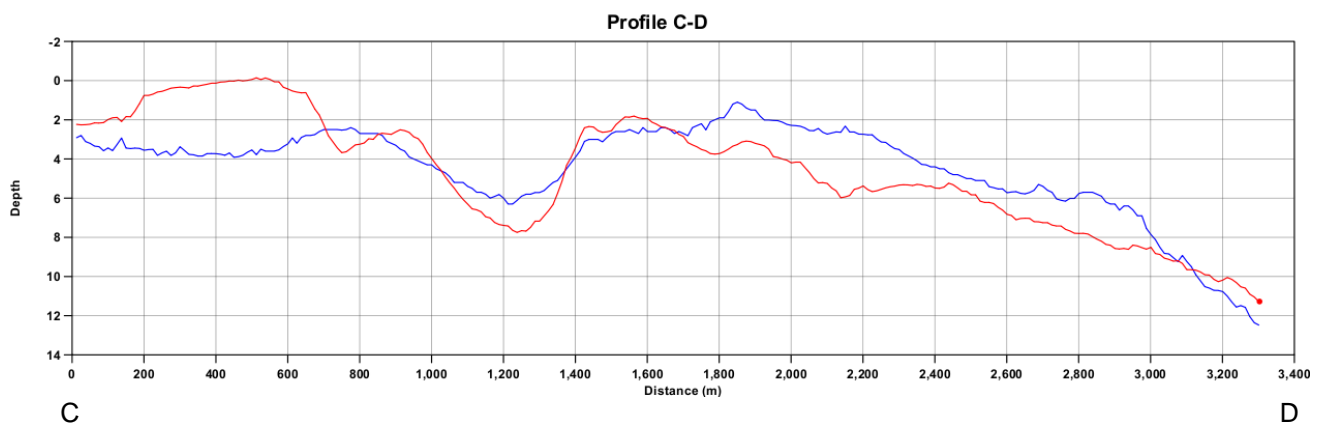
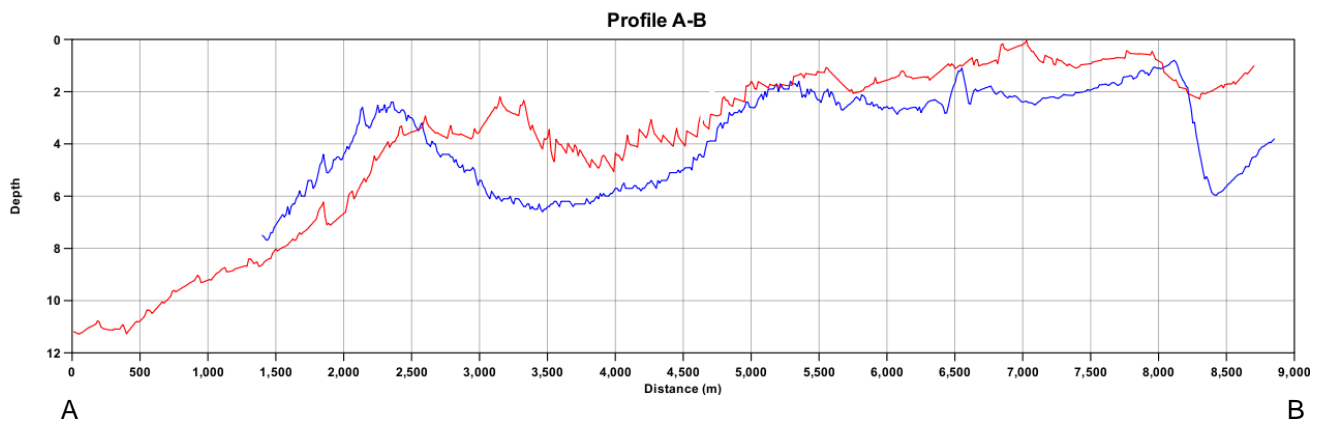
- Main traffic density
- Lower traffic density

SUN ILLUMINATED VIEW OF THE 2014 SURVEY DATA
 OVERLAID ON CHART BA1535
 AND CROSS SECTION LOCATIONS



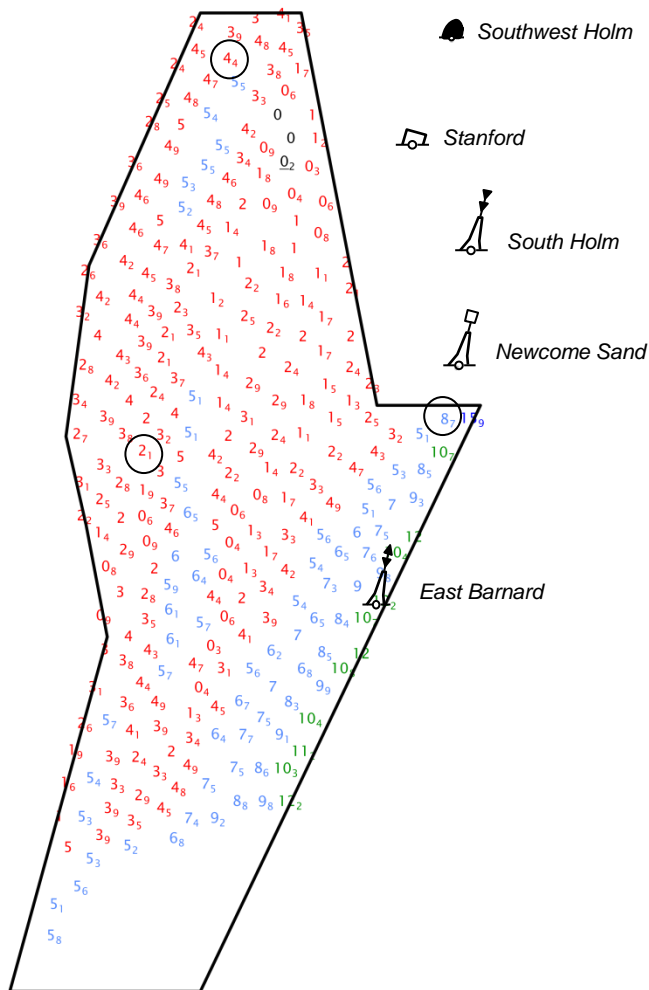
Surface created via interpolation of the 2014 survey data

CROSS SECTIONS FROM THE 2002/2004 and 2014 SURVEYS
 (See Annexe D for locations)



Year of Survey	
—	2014
—	2002/2004

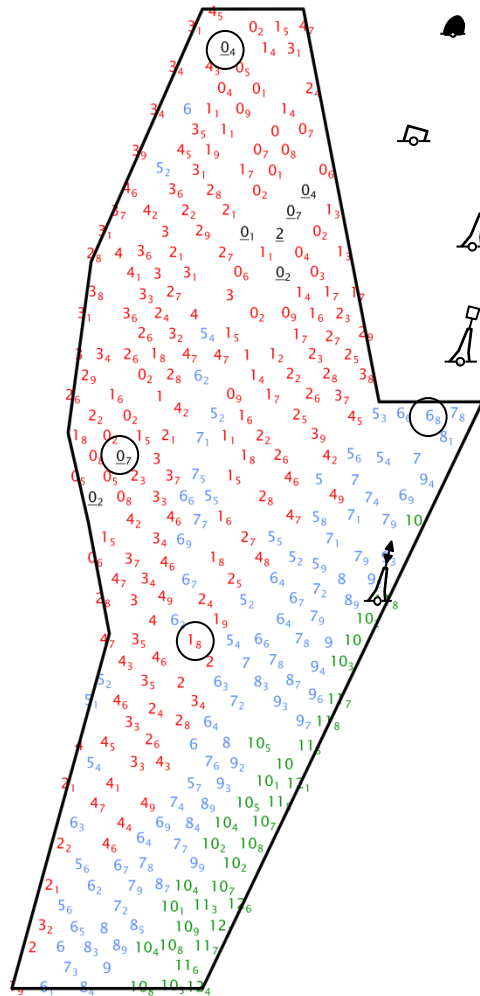
COLOUR BANDED DEPTH PLOT
 FROM THE 2002/2004 SURVEY
 SHOWING SELECTED DEPTHS
 SCALE 1:70,000



○ Selected depth comparisons

Depths in Metres	
	Dries
	0.0 to 5.0
	5.1 to 10.0
	10.1 to 15.0
	15.1 to 20.0
	20.0 <

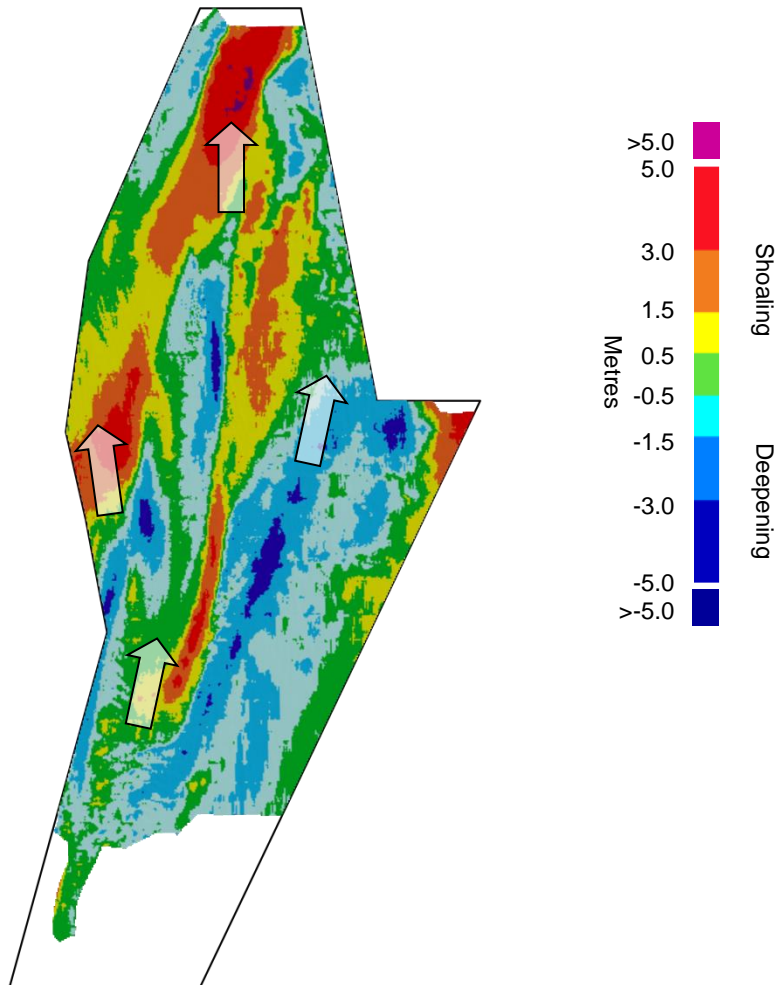
COLOUR BANDED DEPTH PLOT
 FROM THE 2014 SURVEY
 SHOWING SELECTED DEPTHS
 SCALE 1:70,000



○ Selected depth comparisons

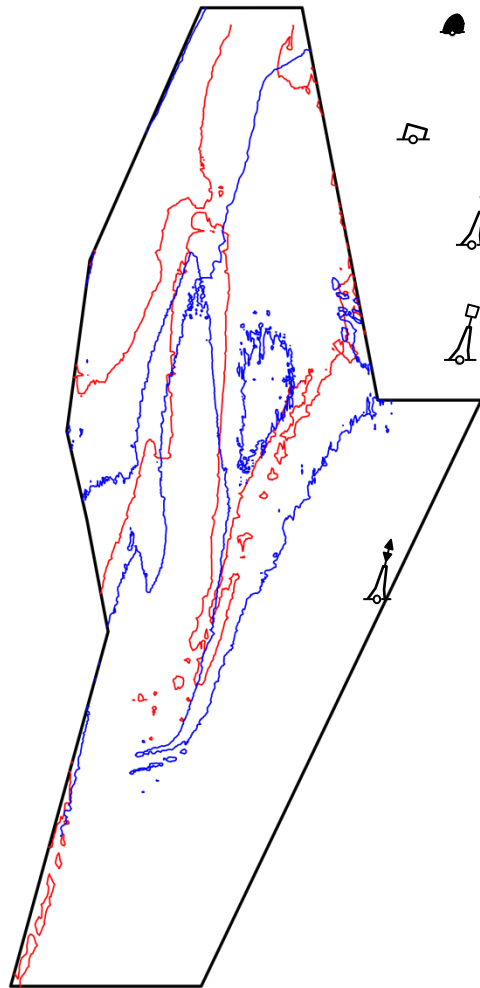
Depths in Metres	
	Dries
	0.0 to 5.0
	5.1 to 10.0
	10.1 to 15.0
	15.1 to 20.0
	20.0 <



VARIABILITY PLOT SHOWING
BATHYMETRIC CHANGES BETWEEN THE 2002/2004 AND 2014 SURVEY DATA
SCALE 1:70,000



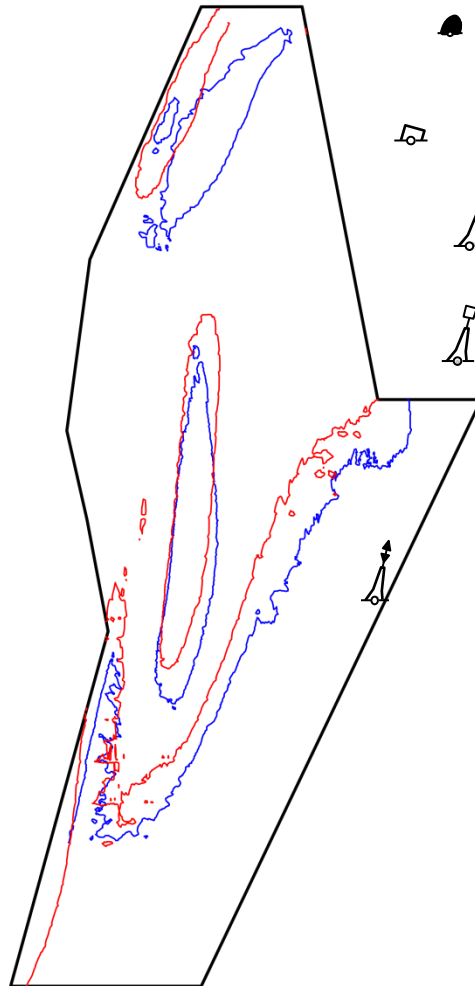
Arrows indicates direction of net sediment transport highlighted in the variability data



COMPOSITE DIAGRAM OF THE
 3 METRE CONTOUR FROM THE 2002/2004 AND 2014 SURVEYS
 SCALE 1:70,000



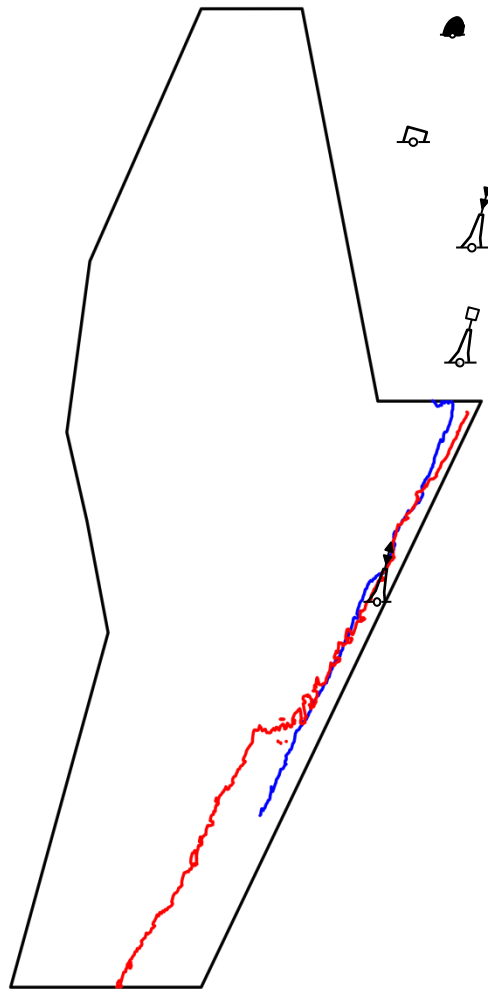
Year of Survey	
	2014
	2002/2004



COMPOSITE DIAGRAM OF THE
5 METRE CONTOUR FROM THE 2002/2004 AND 2014 SURVEYS
SCALE 1:70,000



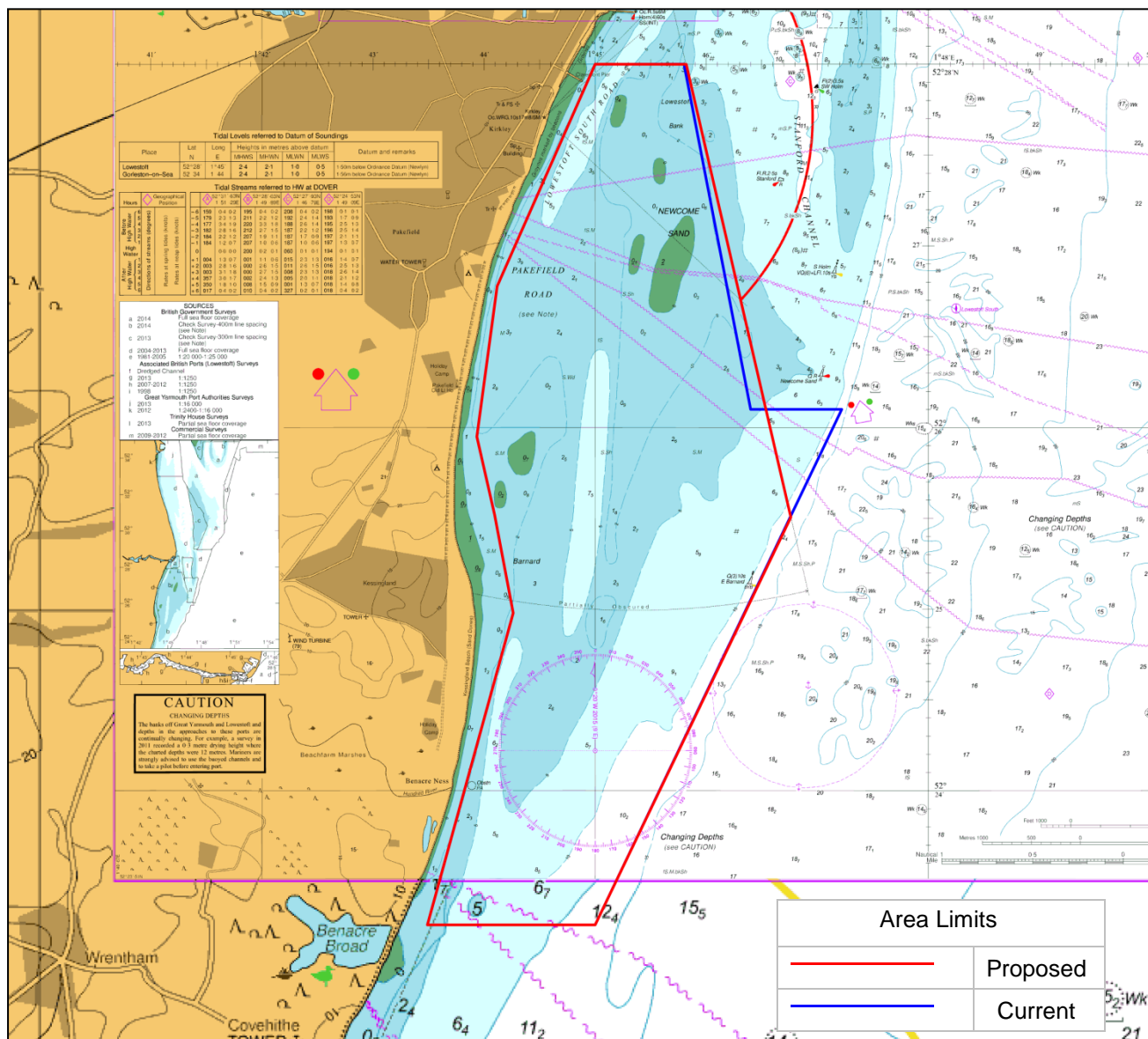
Year of Survey	
	2014
	2002/2004

COMPOSITE DIAGRAM OF THE
10 METRE CONTOUR FROM THE 2002/2004 AND 2014 SURVEYS
SCALE 1:70,000



Year of Survey	
	2014
	2002/2004

PROPOSED NEW LIMITS FOR EA12 SURVEY AREA



The coordinates of the adjusted survey area limits for EA12 are shown below and describe a total area of 19.6km² / 5.7 NM².

- 52° 23.26 N 1° 43.49 E
- 52° 24.98 N 1° 44.26 E
- 52° 25.52 N 1° 44.10 E
- 52° 25.95 N 1° 43.94 E
- 52° 26.78 N 1° 44.12 E
- 52° 28.00 N 1° 45.00 E
- 52° 28.00 N 1° 45.82 E
- 52° 25.51 N 1° 46.76 E
- 52° 23.26 N 1° 45.00 E