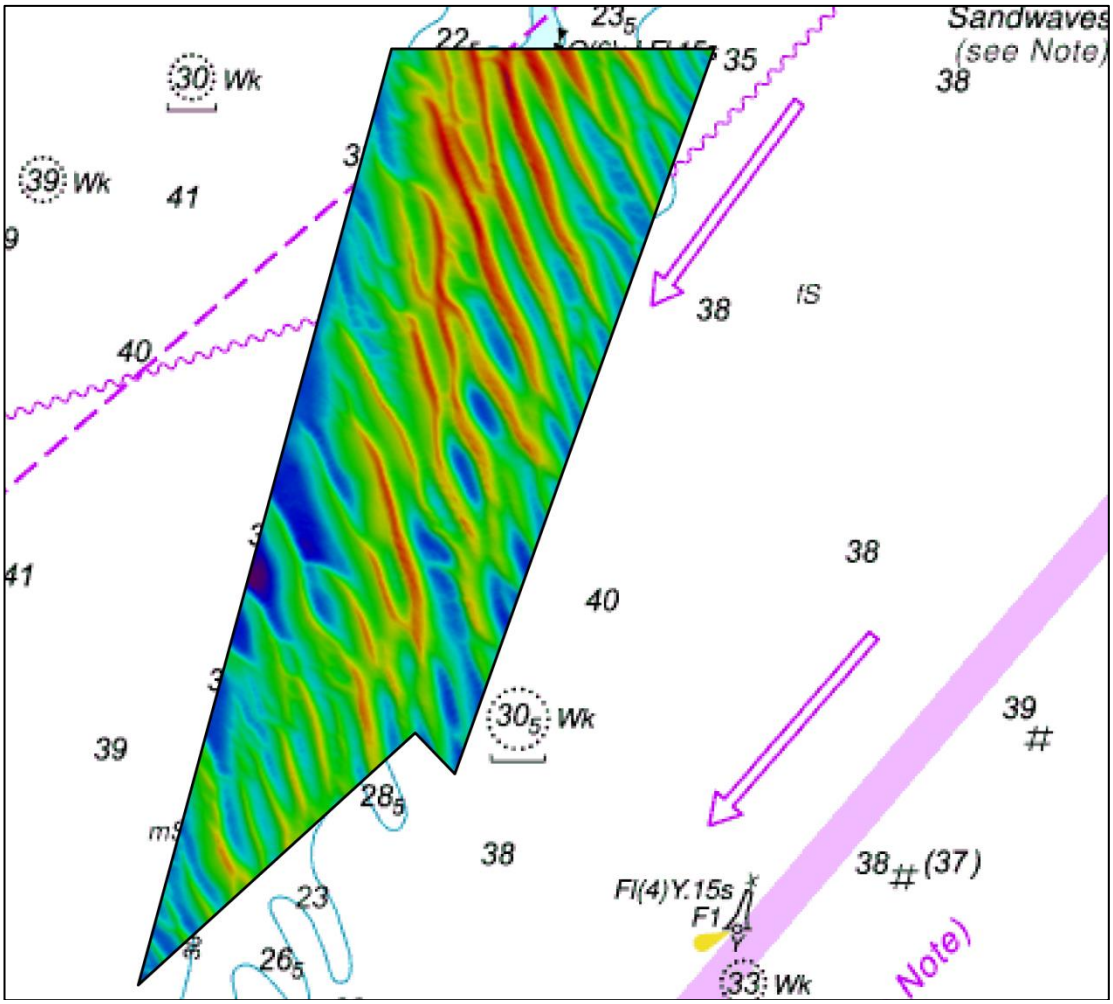
United Kingdom
Hydrographic Office

DOVER STRAIT

TAIL OF THE FALLS

ASSESSMENT ON THE ANALYSIS OF ROUTINE RESURVEY AREA DWR C3 FROM THE 2015 SURVEY



DOVER STRAIT
TAIL OF THE FALLS (C3)
Assessment DWR C3/2015

An assessment of the 2015 hydrographic survey of the area: to monitor recent seabed movement; to identify any implications for shipping; and to make recommendations for future surveys.

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.

CONTENTS

ANNEXES

TAIL OF THE FALLS, DWR C3, 2015

1. EXECUTIVE SUMMARY

The Area and Recent Changes

1.1 Area DWR-C3 is currently re-surveyed every 3 years. Sandwaves 16 metres high lie in the north of the area, with a minimum depth of 18.8 metres, shoaler by 0.9 metres since the last survey.

1.2 Sample shipping data for 2015 shows vessels drawing up to 15.5 metres transit through the area

1.3 Generally the sandwave crests have become shoaler by between 0.5 to 3 metres. The latter figure being generally seen in sandwaves present at water depths deeper than 25 metres which would not affect vessels shown to transit the survey area in the AIS data available.

Reasons for Continuing to Resurvey the Area

1.4 Sandwaves area extending south-westwards from Tail of the Falls provide potentially critical depths to deep draught vessels using the southwest bound lane of the TSS and in particular the deep draught route. In this area, sandwave migration has been shown to occur slowly over many years, but potentially significant changes in sandwave heights occur over much shorter periods.

Recommendations

1.5 The area should be retained with unchanged limits and the same resurvey interval.

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 DfT (including the MCA) and the MOD (including the UKHO).

3. HISTORY

3.1 Area C was established in 1984, when an understanding between the Hydrographers of the Netherlands, Belgium, France and the United Kingdom was reached on national responsibilities for hydrographic surveying in the southern North Sea and Dover Strait. In effect, the understanding modified the surveying limits that would be delineated by official territorial waters / continental shelf boundaries in order to ensure that efficient and coherent surveys are conducted.

3.2 A report in 1986 split Area C into four areas (C, C1, C2 and C3), with the areas being surveyed at 1, 3 or 12 year intervals.

3.3 A report in 1991 further rationalised the areas into three new areas, DWR C1, C2 and C3. Area C1 was to be resurveyed annually with C2 and C3 resurveyed every 3 years. Following the Assessment of the 2003 survey and later surveys, the limits of DWR C1 and C3 have been altered to better focus on the sandwave area.

3.4 Area specifications, including survey history, are in Annex A.

4. DESCRIPTION OF THE AREA

4.1 Area DWR C3 lie in the southwest bound lane of the Dover Strait Traffic Separation Scheme (TSS) and cover 2.3 sq NM (7.88 sq km). The geographic limits are given in Annex A and an image of the 2015 survey overlaid on chart 323 are shown at Annex C.

4.2 The areas cover part of a sandwave field which extends in a southwest direction from Tail of the Falls. These sandwaves dominate the area, with their maximum height ranging from 16 metres in the north, to 12 metres in the south. The shoalest depth in the area is 18.8 metres which is in the vicinity of South Fall South Cardinal Buoy. With the exception of sandwaves along the eastern boundary the sandwaves are northeast facing. The asymmetric sandwaves becoming increasing symmetrical to the northern limit of the area.

4.3 The sun-illuminated view at Annex C shows clear bifurcation (dividing into two branches) of sandwaves in the centre of the area. Where the advancing sandwaves from the southwest merge with opposing sandwave movement along the eastern boundary.

5. SHIPPING IN THE AREA

5.1 The survey area is situated in one of the busiest locations in the separation scheme, with heavy traffic converging and tracking southwest around the southern tip of South Falls. In addition, shipping passes across the TSS within the vicinity of the resurvey area.

5.2 The survey area is located along and outside the limit of the suggested route for deep draught vessels. The route has no formal standing and is not endorsed by the British Authorities. However, details of the route and under-keel allowances recommended by the UK Department for Transport are contained in the Dover Strait Pilot and the Routeing Guide for the English Channel and Southern North Sea.

5.3 Sample shipping data for 2015 shows the maximum draught vessel to transit through the area was 15.5 metres. However the data does show a vessel of 31.6m draught using the suggested deep water track lying to the south and east of area, Indicative routes are shown in Annex B.

6. 2012 SURVEY DETAILS

6.1 The survey was conducted from 18th to 21st September, It is noted in the Report of Survey for HI1399 that survey operations were suspended due to weather condition in the later part of the 18th through to the early morning of the 21st.

6.2 The survey data was acquired on MV Seabeam using a Kongsberg 3002D multibeam echosounder system. The primary reference position was provided by an Applanix POS MV system, supplied with GPS data from C-Nav, a dynamic GPS Precise Point measuring system. The survey is referred to the European Terrestrial Reference Frame 1989 (ETRF89) datum.

6.3 Observations from GPS heighting were combined with the UKHO Vertical Offshore Reference Frame (VORF) to reduce depths to Chart Datum. The final deliverable was a 1 metre CUBE (Combined Uncertainty and Bathymetry Estimator) Surface.

6.4 The survey was validated by UKHO and met IHO S44 (5th Edition) Order 1a standards.

7. 2015 SURVEY DETAIL

7.1 The survey was conducted from 21st to the 22nd August, It is noted in the Report of Survey for HI1484 that the vessel was on weather standby either side of these dates which also prevented full day's survey on both the dates mentioned above.

7.2 The survey data was acquired onboard the FPV Morven using a Kongsberg EM2040C (hull-mounted, dual head) multibeam echosounder system. The primary reference position was provided by an Applanix POS MV system, supplied with GPS data from C-Nav, a dynamic

GPS Precise Point measuring system. The survey is referred to the International Terrestrial Reference Frame 2005 (ITRF2005) datum.

7.3 Observations from GPS heighting were combined with the UKHO Vertical Offshore Reference Frame (VORF) to reduce depths to Chart Datum. The final deliverable was a 1 metre CUBE (Combined Uncertainty and Bathymetry Estimator) Surface.

7.4 The survey was validated by UKHO and met IHO (S44 5th Edition) Order 1a standards. The surface overlaid on chart 323 is shown at Annex C.

8. DESCRIPTION OF RECENT BATHYMETRIC CHANGE

8.1 Based on the following:

I. Profile comparisons from the 2012 and 2015 surveys are presented in Annex D.
II. Colour banded depth plots of the 2012 and 2015 surveys are at Annexes E and F respectively and allow visual comparison.
III. Variability plot showing the depth differences between the 2012 and 2015 surveys in Annex G
IV. Comparison plot of the 30 metre contour is at Annex H.

The inferred residual sediment transport direction indicates that the trends in sandwaves mobility fall in to three groups based on their location within the area.

a. Sandwaves in the south and along the whole western boundary are typically advancing north east by between 50 to 100 metres over the period of 2012 to 2015 with the crests generally becoming shoaler by 0.5 to 2 metres. The latter generally being for sandwaves in waters depths greater than 30 metres.
b. Sandwaves present along the centre long axis of the survey area are either generally shown to be stationary or those in the vicinity of South Fall South Cardinal Buoy are advancing northwest by between 10 to 25 metres over the period of 2012 to 2015 with only minor variations in height.
c. Sandwaves along the eastern boundary are typically either stationary or have advanced south/southeast by between 25 to 50 metres over the period of 2012 to 2015 shoaling by 0.5 to 3 metres. The latter generally being for sandwaves in waters depths greater than 25 metres.

8.2 In the south of the area, the minimum depth in the 2015 survey is 22.3 metres no significant change since the 2012 survey (Shown in the Depth Plot in Annex E and F). Depths in this area in the last seven surveys have ranged from 20.6 to 22.6 metres, as shown below in figure 8.1.

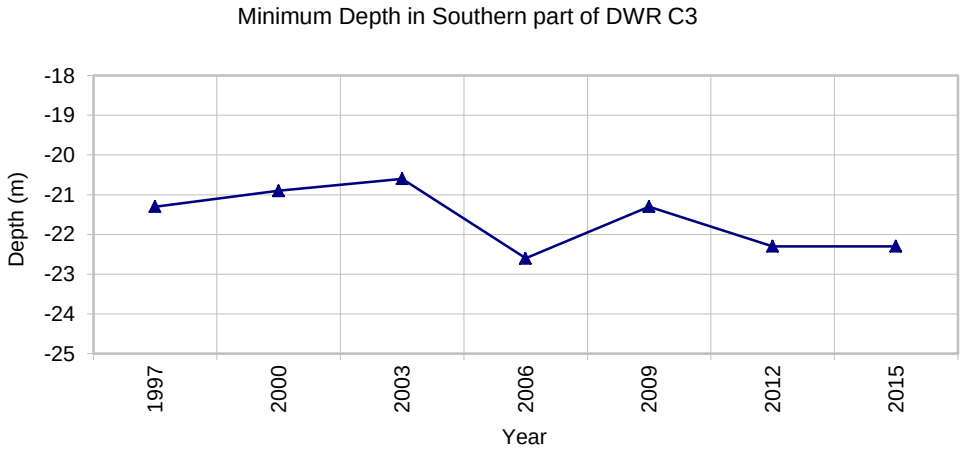


Figure 8.1 – Long term monitoring of shoalest depth in DWR C3 South

8.3 In the north, minimum depths from two general areas have been extracted (figure 8.2). This shows that over the last seven surveys minimum depths in the north have ranged from 18.0 to 19.9 metres. As shown in the Depth Plot in Annex E and F since 2012 this area has become shoaler both in Area A by 0.9 metres and in Area B by 0.8 metres

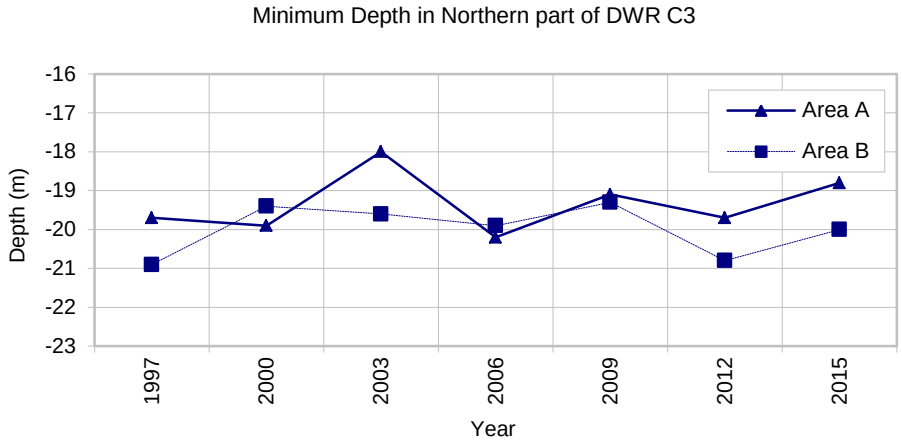


Figure 8.2 – Long term monitoring of shoalest depth in DWR C3 North

9. IMPLICATIONS FOR SHIPPING

9.1 Depths across the area remain deeper than the draught of shipping observed using the area. The minimum depth of 18.8 metres in the 2015 survey is 0.9 metres shoaler than the 2012 survey, 3.3 metres deeper than the largest vessel observed transiting through the survey area.

10. RECOMMENDATIONS FOR FUTURE SURVEYS

10.1 The area should be retained with unchanged limits with the same resurvey interval.

AREA SPECIFICATIONS

(Including Survey History)

REGION: Deep Water Route **NAME:** Tail of the Falls **AREA:** DWR C3

LIMITS:

A	51º.23333N	1º.71950E
B	51º.23333N	1º.74667E
C	51º.19500N	1º.72483E
D	51º.19717N	1º.72150E
E	51º.18383N	1º.69817E
A	51º.23333N	1º.71950E

AREA SIZE: 2.3 SQ NM (7.88 SQ KM)

SURVEY INTERVAL: 3 yr

SURVEYS: (conducted at 1:25,000 scale (not applicable to multibeam surveys))

Year	Survey	File Ref	Data
1988	M1239	H6345/87	s.t.d
1991	M1779	HH090/518/01	s.d
1994	M2295	HH090/632/01	s.d
1997	M2839	HH090/745/01	s.t.d
2000	M3411	HH090/889/01	s.d
2003	M3925	HH090/1024/01	s.t.d
2006	M4628	HH091/159/01	s.t.d
2009	HI1294	2009-29529	m
2012	HI1399	2012-131314	m
2015	HI1484	2015-83470	m

KEY: s = sonar sweep, t = seabed texture tracing, d = digital data, m = multibeam digital data
Singlebeam surveys (prior to 2004) conducted at 1:25,000 scale

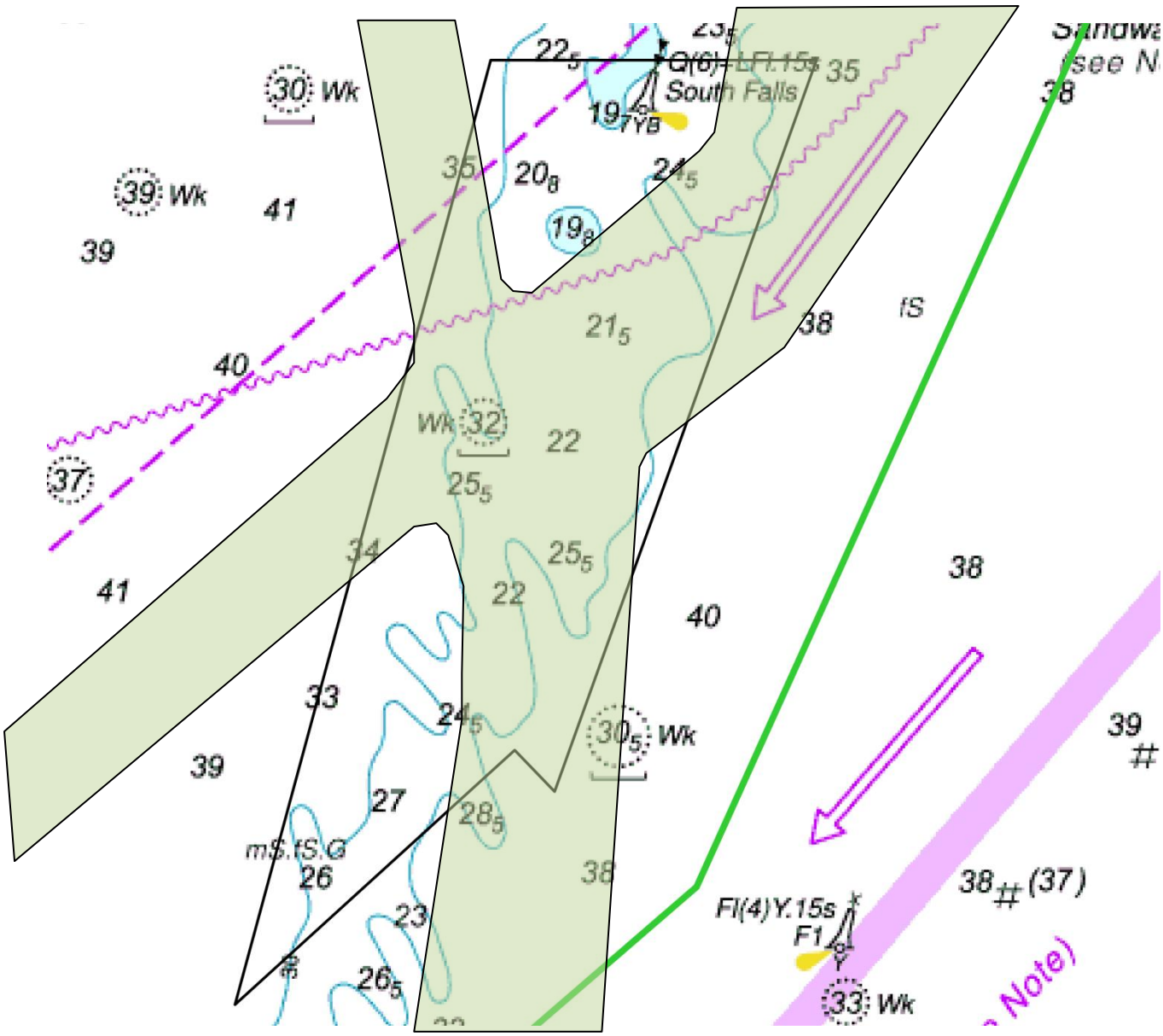
REPORTS:
1986 HH0423/86
1991 Latest survey included M1239 (HA145/02/03/01 - E3)
1998 Latest survey included M2839 (HA145/010/06/01)
1999 Combined report on C1, C2 and C3 (91, 94 and 97 surveys)

ASSESSMENTS: 2001 M3411 (HA145/010/012/01 – E3)

REMARKS:
1984 Area C established (H6026/82-E53).
1986 Report divides area C into new areas C, C1, C2 and C3 (H0423/86).
1993 Report on areas C, C1, C2 and C3 removes area C and limits and survey intervals of areas C1, C2 and C3 amended (HA145/02/03/01-E3).
1997 Sandwave Analysis Report (HA107/042/003/02) (parts of C1 & C3) – examining five surveys conducted over a 1 month period.
1999 Limits change. See Report RRA C1, C2, C3, March 99
2010 Limits change. See Report DWR C1-C3/2009, June 2010

LARGEST SCALE CHART: BA 323 (1:75,000)

SHIPPING ROUTES



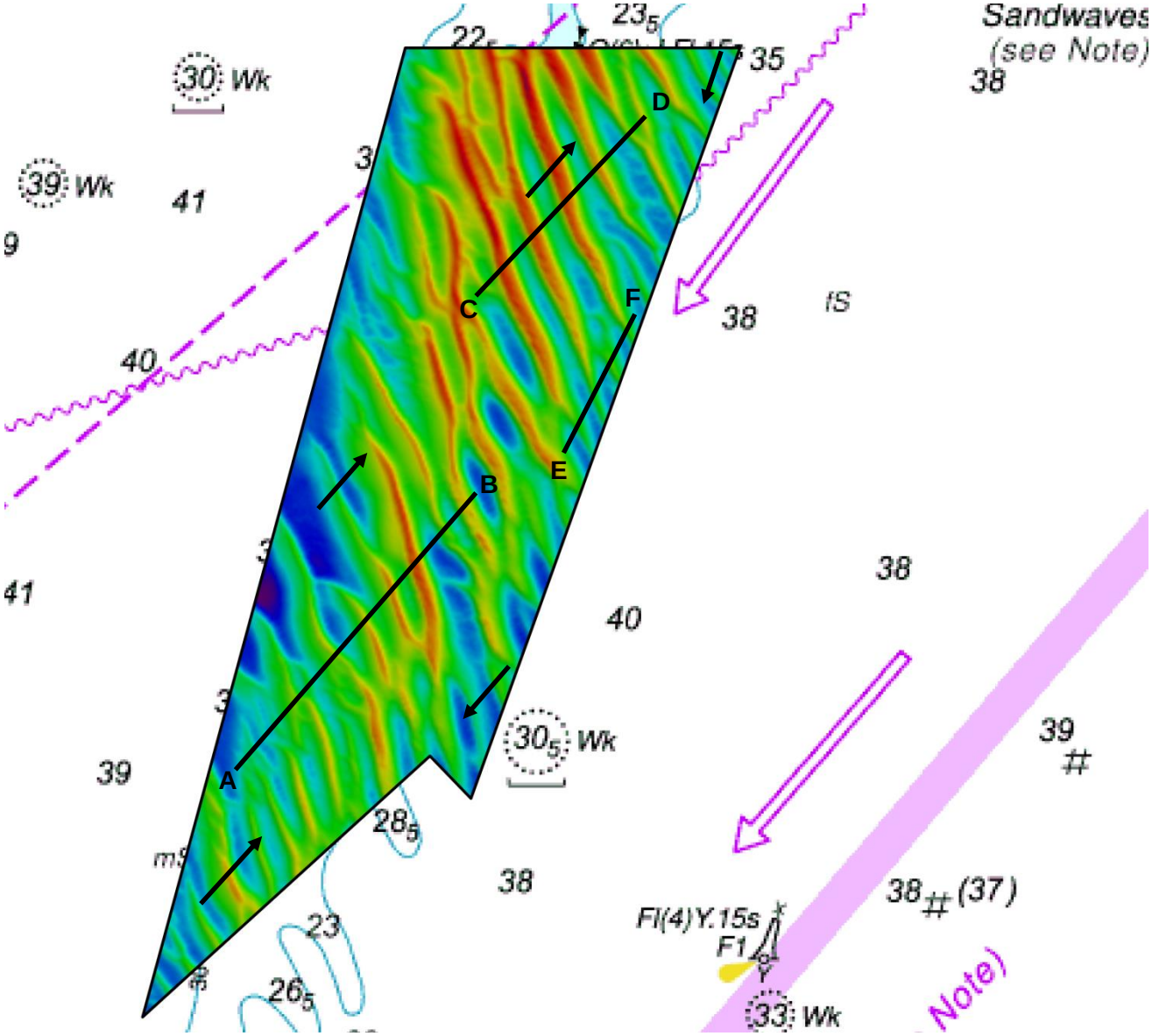
Deep Water Track

Limits of DWR-C3 survey Area

Indicative shipping routes through area DWR_C3

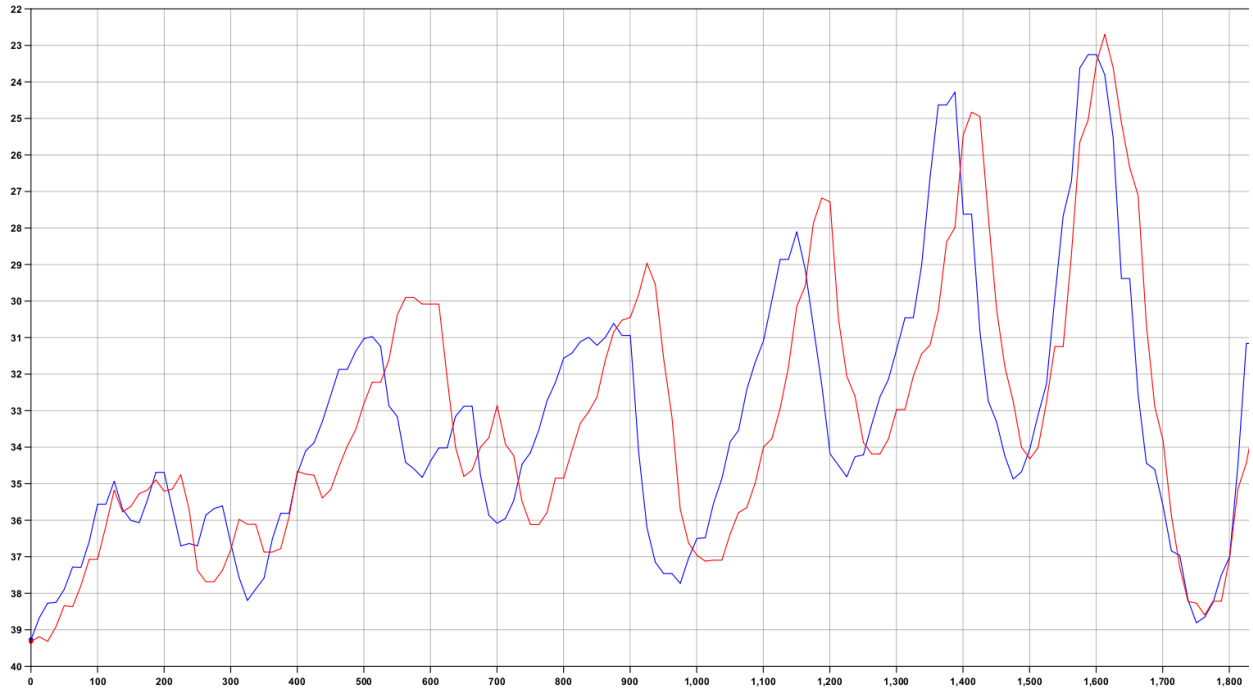
Note: Data from satellite AIS data for FY2015/2016 of vessels larger then 2000GT

2015 SURVEY DATA OVERLAID ON CHART 0323
WITH LOCATIONS OF CROSS SECTION COMPARISONS
(SEE ANNEX D FOR CROSS-SECTION PROFILES)
(Shown at Annex D)

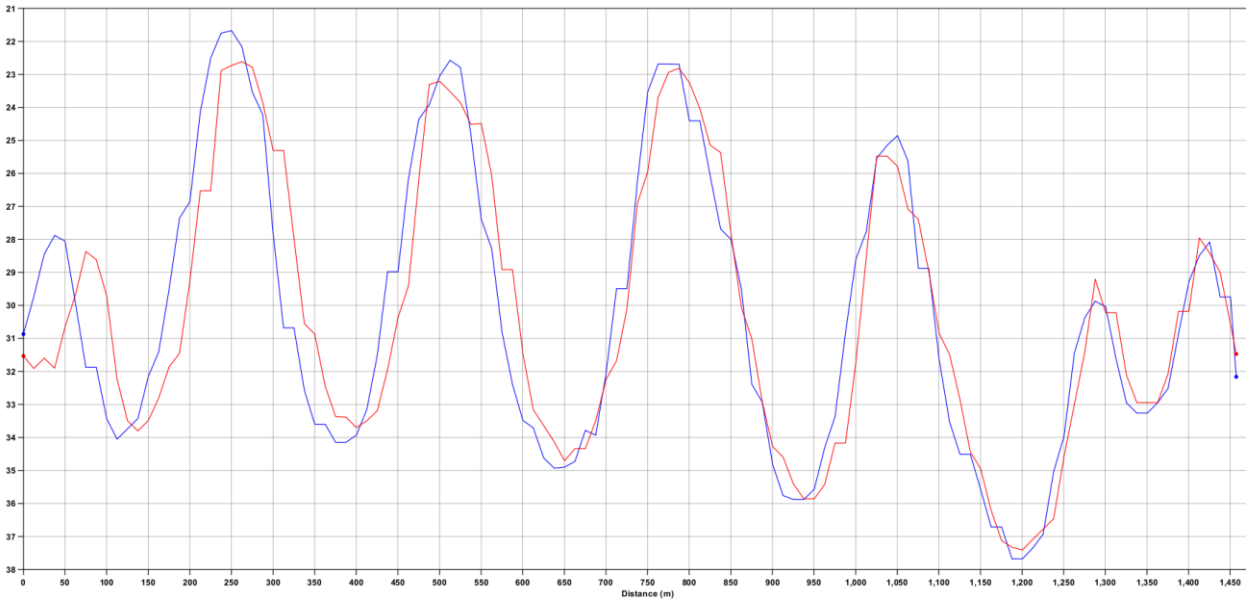


CROSS SECTION COMPARISONS FROM THE 2012 AND 2015 SURVEYS

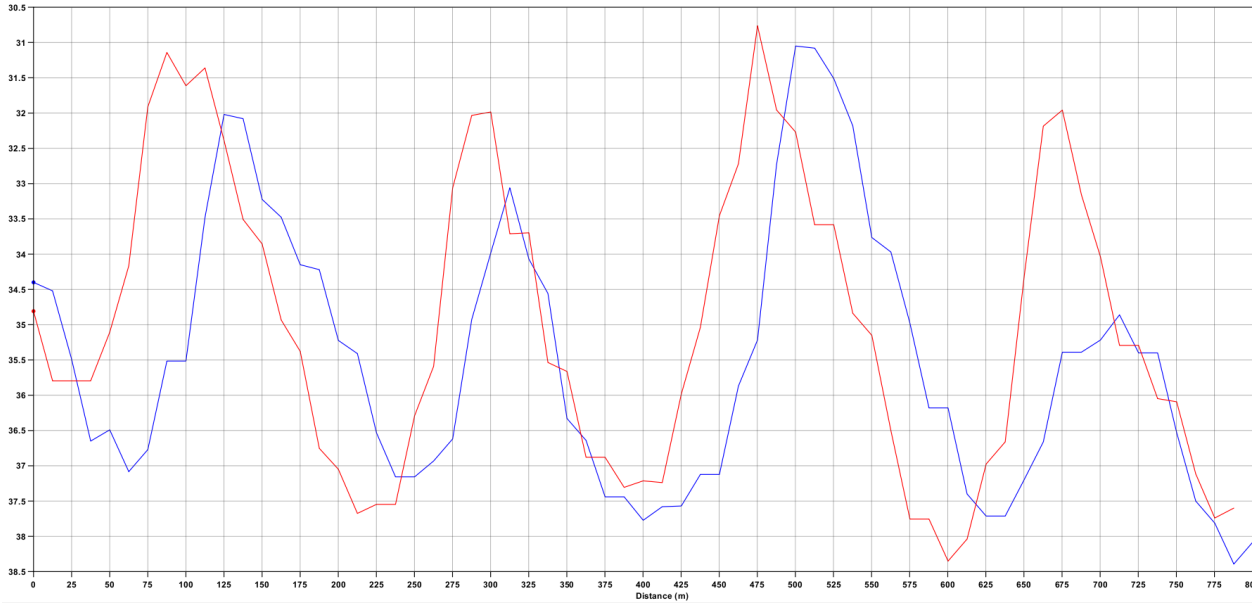
(See Annex C for Locations)



A Profile A – B B



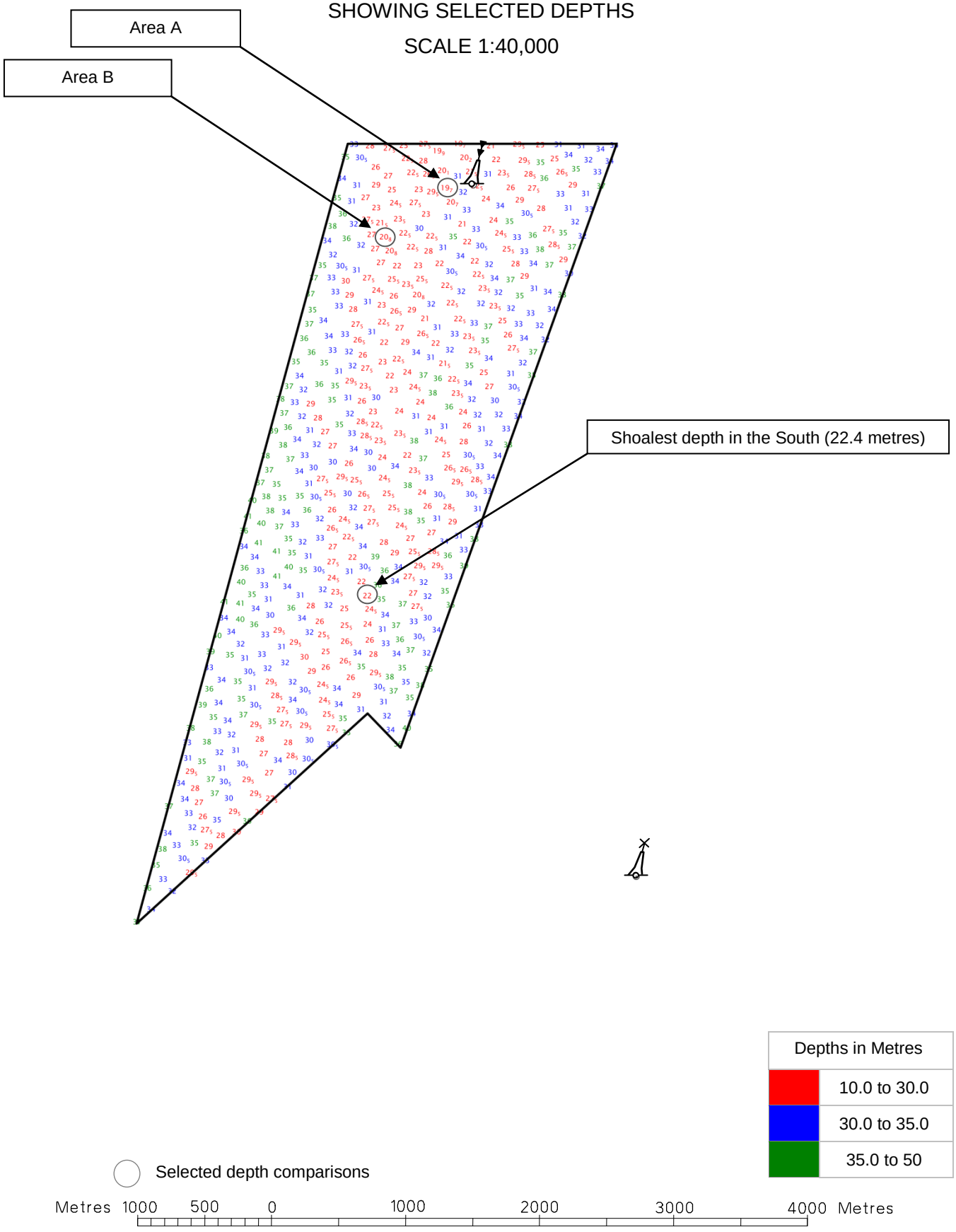
C Profile C – D D



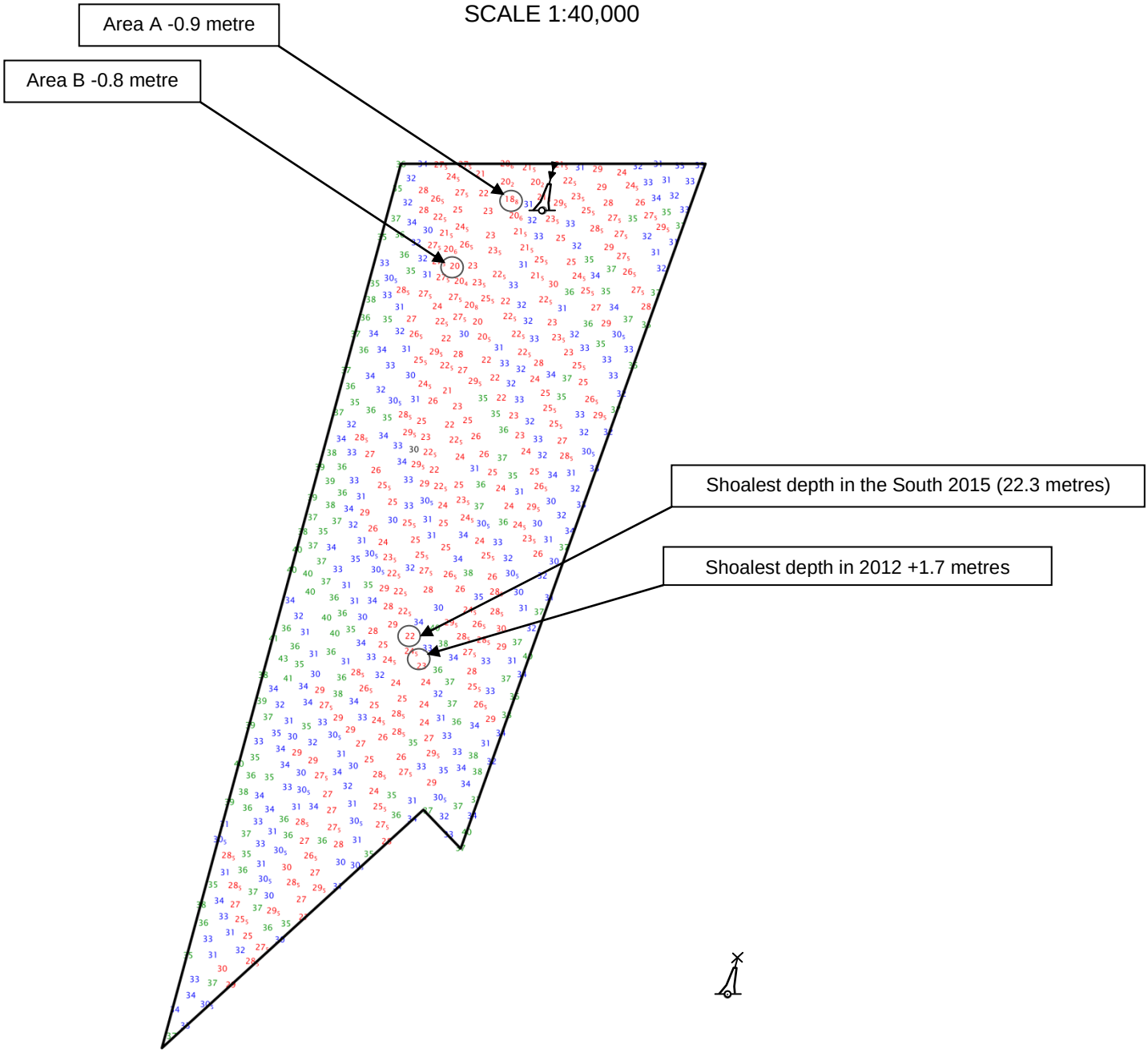
E Profile E – F F

Year of Survey	
	2015
	2012

COLOUR BANDED DEPTH PLOT
FROM THE 2012 SURVEY
SHOWING SELECTED DEPTHS
SCALE 1:40,000



COLOUR BANDED DEPTH PLOT
FROM THE 2015 SURVEY
SHOWING SELECTED DEPTHS
SCALE 1:40,000



Note: depth changes indicated are for the same location as the sounding derived from the 2015 survey data. Hence values may not match the difference between the soundings shown in historical survey data and 2015 depth plots as shoal bias sounding selection will select different positions that best represent the shoal values in a data set

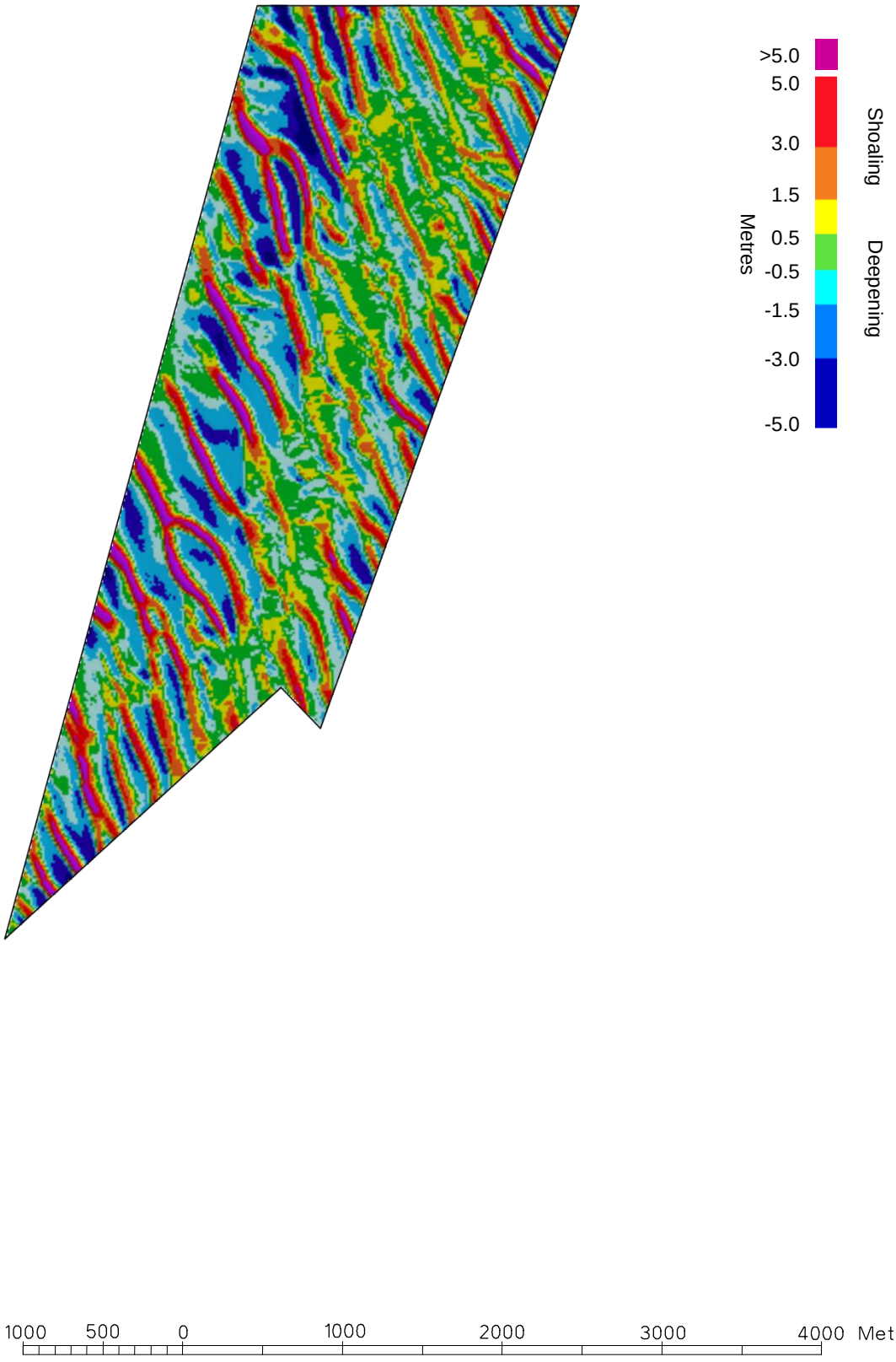
Deepening + positive value / shoaling - negative value

Selected depth comparisons

Depths in Metres	
	10.0 to 30.0
	30.0 to 35.0
	35.0 to 50

Metres 1000 500 0 1000 2000 3000 4000 Metres

VARIABILITY PLOT SHOWING
BATHYMETRIC CHANGES BETWEEN THE 2012 AND 2015 SURVEYS
SCALE 1:40,000



COMPOSITE DIAGRAM OF THE
30 METRE CONTOUR FROM THE 2008 AND 2014 SURVEYS
SCALE 1:40,000