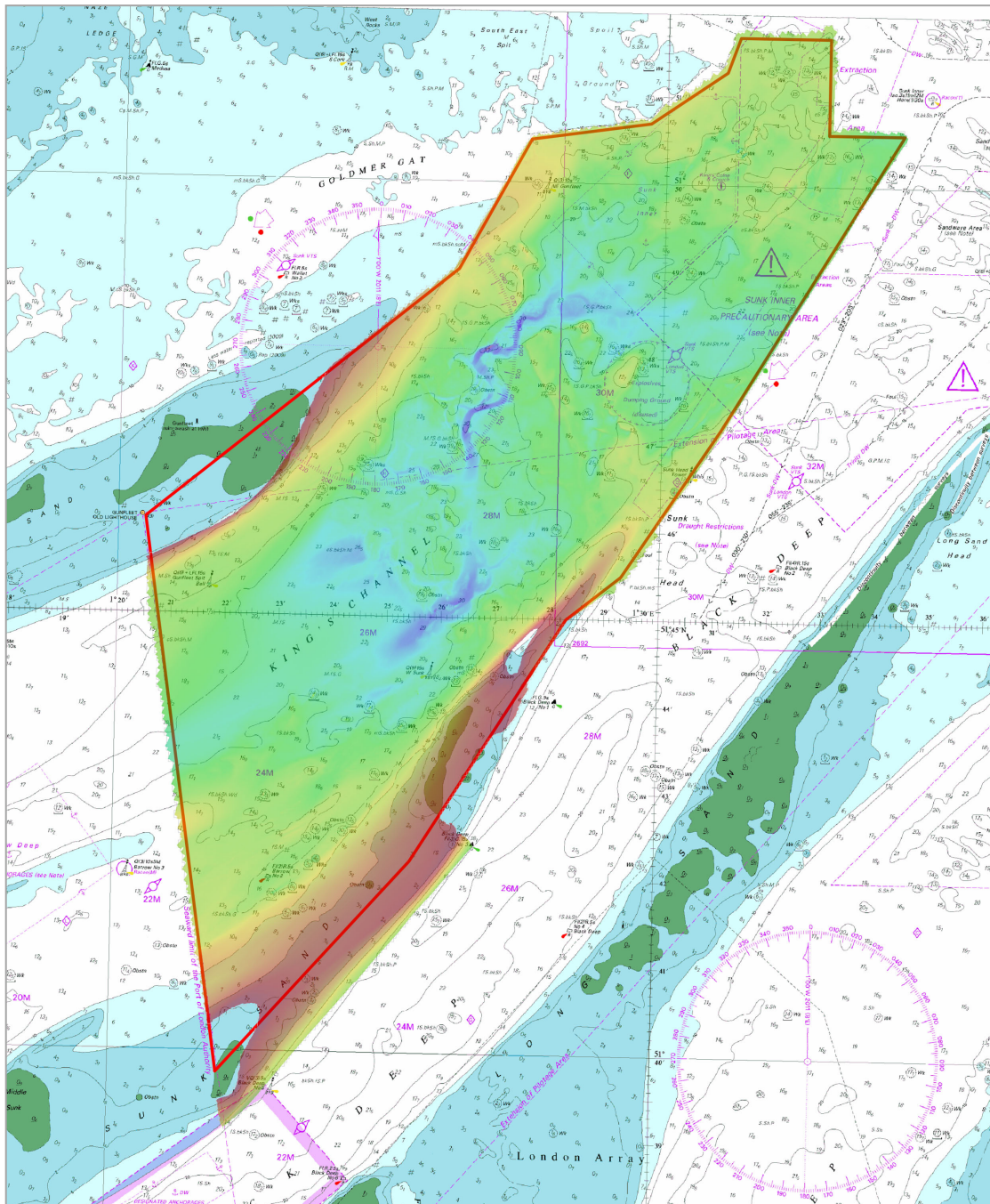




THAMES ESTUARY KINGS CHANNEL

ASSESSMENT ON THE ANALYSIS OF ROUTINE RESURVEY AREA TE7 FROM THE 2012 SURVEY



THAMES ESTUARY

KINGS CHANNEL

Assessment TE7/2012

An assessment of the 2012 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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KINGS CHANNEL, 2012

1. EXECUTIVE SUMMARY

The Area and Recent Changes

- 1.1 Area TE7 is scheduled to be re-surveyed every 12 years, and the 2012 survey is the first multibeam survey of the area.
- 1.2 Kings Channel provides depths of over 15 metre across much of the area, but is delimited by the shoal banks of Gunfleet Sand and Sunk Sand.
- 1.3 The northern and central area of Kings Channel has changed little since the 2000 survey. In the remainder of the area, changes have occurred over Gunfleet Sand and Sunk Sand, along their slopes down into deep water, and in the southern part of the area within Kings Channel itself.

Reasons for Continuing to Resurvey the Area

- 1.4 Kings Channel forms one of the approaches to the Thames Estuary and is delimited by the mobile banks of Gunfleet Sand and Sunk Sand.

Recommendations

- 1.5 It is recommended that the limits of the full area are retained, but with slight revision to the north-western limit and the survey frequency extended from 12 to 24 years. The introduction of new buoys in October 2013, marking deep water to the west of the current Sunk Deep Water route, is likely to result in adjacent area TE5A expanding into the northeast of TE7.
- 1.6 It is recommended that two focused areas are established with a 12 year re-survey frequency to cover dynamic areas of potential concern to shipping, adjacent to the banks and in the south of the area.

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, 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 TE7 was established in 1980 following a general re-scheming of the Thames areas, but with similar extents to former area 'H'. The area initially had a re-survey frequency of 6 years, but alternating between full and wide spaced check-line surveys.
- 3.2 Following the 2000 check-line survey, it was agreed that the intervening check-line surveys should be discontinued and the re-survey effort reduced to a full survey every 12 years. The Civil Hydrography Working Group agreed that the full survey originally programmed for 2006 should be put back to 12 years after the check-line survey and be conducted in 2012.

3.3 Details of the area, including survey history, are at [Annex A](#).

4. DESCRIPTION OF THE AREA

4.1 The area covers 42 SQ NM (144 SQ km). Kings Channel is marked by Sunk sand to the south and Gunfleet Sand to the north. Isolated areas of mega-ripples exist within the channel and along the sides of the banks that delimit Kings Channel; the area is devoid of large sandwaves, although isolated ridges and other small features exist across the area.

4.2 A large number of wrecks are distributed across the area.

4.3 In the northeast of the area there is evidence of aggregate extraction in the 2012 survey.

4.4 The area limits are shown at [Annex C](#).

5. SHIPPING IN THE AREA

5.1 Most of the shipping using the area travels down the southern side of Kings Channel before entering Barrow Deep and onwards into the Thames Estuary, with vessels reporting draughts up to 7.8 metres observed using the route. The south-western end of Barrow Deep shoals to less than 5 metres, requiring the deeper draught ships to make use of the tide.

5.2 A much smaller number of vessels track north-westwards towards the River Crouch, which is visited by over 60 small cargo ships a year.

5.3 A few vessels also cross the northern part of TE7 to access Goldmer Gat and onwards towards Brightlingsea and the River Colne.

5.4 Barges drawing 3 metres have been observed using Spitway to the west of TE7 en-route between the Thames and Ballast Quay on the River Colne. This area falls outside the re-survey programme, but was surveyed under the Civil Hydrography Programme in 2011; the swatchway provides depths of around 1.5 metres at Chart Datum.

5.5 Sunk Inner anchorage area lies in the north of the area, with vessels drawing 8.3 metres observed using the area. Barrow Deep anchorage area lies to the southwest of area TE7 inside the Port of London Authority limits.

5.6 A general representation of the main shipping routes is shown at [Annex B](#).

6. 1994 SURVEY DETAILS

6.1 The survey of was conducted from 10 May to 4 June, with sounding lines at 62.5 metre spacing run in the direction of 035°/215°. Weather conditions were variable throughout but dominated by east and north easterly winds of between force 2 and 6.

6.2 Positioning was by Trisponder, with the survey referred to Ordnance Survey (Scientific Network) 1980 Datum.

6.3 The survey was considered to have achieved the horizontal accuracy of +/-13 metres, with an estimated vertical accuracy of +/-0.34 metres.

7. 2000 SURVEY DETAILS

7.1 The survey of was conducted from 6 to 16 April as a check-line survey, with lines run 500 metres apart. Conditions were good at the beginning of the survey but deteriorated towards the end, with the winds increasing to force 4.

- 7.2 Positioning was by DGPS, with the survey referred to the European Terrestrial Reference Frame 1989 (ETRF89) Datum.
- 7.3 The survey was considered to have achieved the horizontal accuracy of +/-13 metres, with an estimated vertical accuracy of +/-0.3 metres.

8. 2012 SURVEY DETAILS

- 8.1 The survey was conducted from 21 October to 3 December, with weather interrupting operations on several days. Sea states 2 to 5 were experienced in the survey area during data gathering, but survey work generally ceased during sea state 5.
- 8.2 Survey data was acquired using a Kongsberg Maritime EM3002D multibeam 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), with positions referred to ETRF89. The final dataset was in the form of a 1 metre gridded CUBE surface.
- 8.3 The north-east area of TE7 was also fully surveyed with multibeam as part of an aggregate extraction monitoring survey in March 2012, but this survey has not been included in the analysis.
- 8.4 The survey achieved IHO Order 1a standard. The 2012 survey data overlaid on chart 1975 is shown at [Annex C](#).

9. DESCRIPTION OF RECENT BATHYMETRIC CHANGE

- 9.1 Colour banded depth plots of the 1994, 2000 and 2012 surveys are at [Annexes E, F and G](#) respectively and allow visual comparisons.
- 9.2 A variability plot at [Annex H](#) shows the changes in depth between the 1994 and 2012 surveys.
- 9.3 Comparison plots of the 2, 5, 10, 15 and 20 metre contours are at [Annexes I to M](#).
- 9.4 The northern and central area of Kings Channel has changed little since the 2000 survey. In the remainder of the area, changes have occurred over Gunfleet Sand and Sunk Sand, along their slopes down into deep water, and in the southern part of the area within Kings Channel itself. This is shown in cross-sections at [Annex D](#).
- 9.5 In the north, Gunfleet Sand has extended north-eastwards with depths in the vicinity of Northeast Gunfleet buoy shoaling by up to 4 metres ([Annex D](#), profile A-B).
- 9.6 Gunfleet Sand has undergone change along much of its length as shown in the variability plot at [Annex H](#) and ([Annex D](#), profiles C-D and E-F). These changes extend down to the channel depths of over 20 metres. Although the area of change is extensive, the position of the 10 metre contour remains in broadly the same position, as shown in [Annex K](#).
- 9.7 Sunk Sand has receded in some areas and expanded in others. In the far south of the area the 10 metre contour has extended into the channel by 390 metres since the 2000 survey. A charted drying area has disappeared, but a smaller area to the northeast, un-surveyed due to the depth of water, is likely to dry with a minimum depth of 0.1 metres surveyed. The extent of this area is shown in [Annexes C and G](#).
- 9.8 Within Kings Channel itself, most of the area has changed little, with the only notable changes occurring in the south of the area. In an area close to the Port of London Authority limit, depths have shoaled by up to 3.6 metres since 1994, reducing from 14.4 to 10.8 metres. This appears to be the result of a northeast extension to the shoal area extending from North East Middle bank, which lies inside the port limits to the west of TE7 (see figure 9.1). Historical

charts suggest there may be a long-term north-easterly migration of the ridge. To the north of this area, a region of relatively deep water has shoaled by up to 2 metres in general depths of around 20 metres.

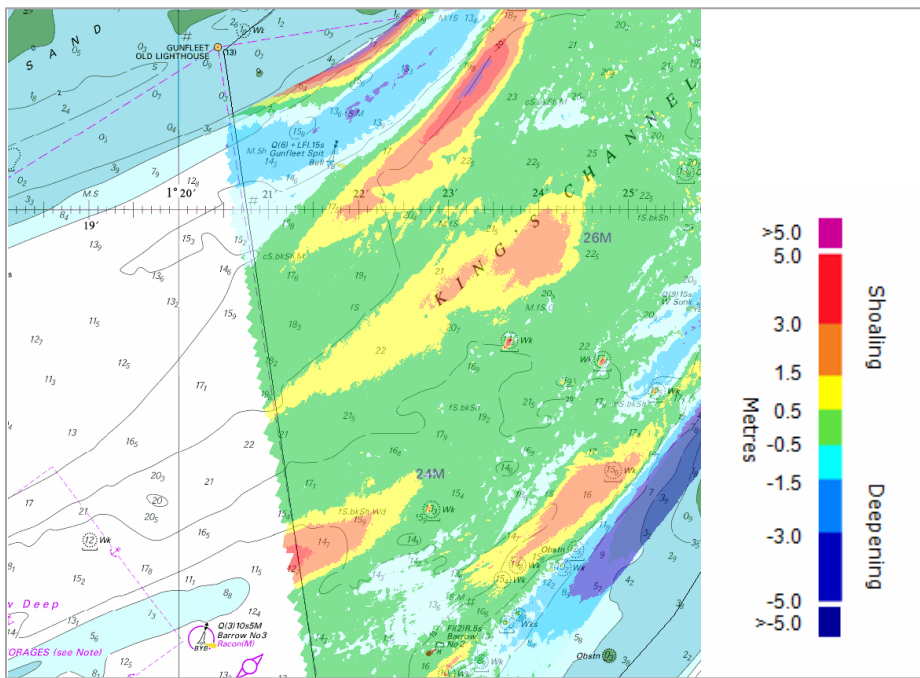


Figure 9.1: Areas of shoaling between 1994 and 2012 surveys in the south of Kings Channel

10. IMPLICATIONS FOR SHIPPING

- 10.1 Although depths over the shoal areas of the banks are particularly dynamic, the 10 metre contour remains adequately marked by the buoyage and changes should be of no immediate concern to vessels using the buoyed channel.
- 10.2 Gunfleet Sand has extended north-eastwards at its northern end. The north-eastern end of North East Middle bank has also expanded north-eastwards and, should this continue, would result in the 10 metre contour moving into the south of area TE7 (paragraph 9.8 refers).

11. RECOMMENDATIONS FOR FUTURE SURVEYS

- 11.1 Use by shipping, depth of water and changes observed, do not support fully re-surveying the full area every 12 years.
- 11.2 It is recommended that two focused areas are established with a 12 year re-survey frequency to cover dynamic areas of potential concern to shipping. The limits of these areas are shown at [Annex N](#) and detailed below.
- 11.3 It is recommended that the limits of the full area retained, but with slight revision to the north-western limit and the survey frequency extended from 12 to 24 years.
- 11.4 Yellow Pillar Buoys marking deep water in Black Deep are due to be deployed in October 2013 as part of the London Gateway project. Dynamo buoy in the north (shown in [Annex I](#)) will lie 650 metres west of the current Sunk Deep Water track and it is likely that area TE5A will be expanded into the eastern part of TE7 to cover this revised route.

Sunk Sand 12 Year Focused Area

	Latitude	Longitude
1	51.68165N	001.36210E
2	51.75000N	001.47167E
3	51.75833N	001.48833E
4	51.76925N	001.50000E
5	51.77740N	001.48530E
6	51.70950N	001.38200E
7	51.72100N	001.36870E
8	51.71550N	001.35405E
9	51.66250N	001.36670E

Gunfleet Sand 12 Year Focused Area

	Latitude	Longitude
1	51.73980N	001.34800E
2	51.84460N	001.49130E
3	51.84167N	001.45833E
4	51.80100N	001.41550E
5	51.75140N	001.34515E

TE7 Full Area

	Latitude	Longitude
1	51.66250N	001.36667E
2	51.70333N	001.42500E
3	51.75000N	001.47167E
4	51.75833N	001.48833E
5	51.78667N	001.51833E
6	51.84333N	001.57333E
7	51.84333N	001.55000E
8	51.86167N	001.55000E
9	51.86167N	001.52217E
10	51.85500N	001.51833E
11	51.84500N	001.49500E
12	51.84167N	001.45833E
13	51.76868N	001.34058E
14	51.66500N	001.36667E

AREA SPECIFICATION
(Including Survey History)

REGION: Thames Estuary**NAME:** KINGS CHANNEL**AREA:** TE7**LIMITS:**

Full Area (12 yr)

A	51.66250N	1.36670E
B	51.70333N	1.42500E
C	51.75000N	1.47167E
D	51.75833N	1.48833E
E	51.78667N	1.51833E
F	51.84333N	1.57333E
G	51.84333N	1.55000E
H	51.86167N	1.55000E
I	51.86167N	1.52217E
J	51.85500N	1.51833E
K	51.84500N	1.49500E
L	51.84167N	1.45833E
M	51.81667N	1.43667E
N	51.76833N	1.34167E

Area co-ordinates are referred
to WGS84 Datum

AREA SIZE: 41.9 SQ NM (143.71 SQ KM)**SURVEY INTERVAL:** Full survey every 12 yrs. Check-line survey every intervening 6yrs**SURVEYS:** (conducted at 1:25,000 scale (not applicable to multibeam surveys))

Year	Survey	File Ref	Data	Year	Survey	File Ref	Data
1982	K9045	H2044/81	s.t				
1988	M1204	H6339/87	s.c.d				
1994	M2276	HH090/628/01	s.d				
2000	M3352	HH090/887/01	s.c.d				
2012	HI1398	2012-117404	m				

KEY: s = sonar sweep, t = seabed texture tracing, d = digital data, m = multibeam digital data c = check-lines

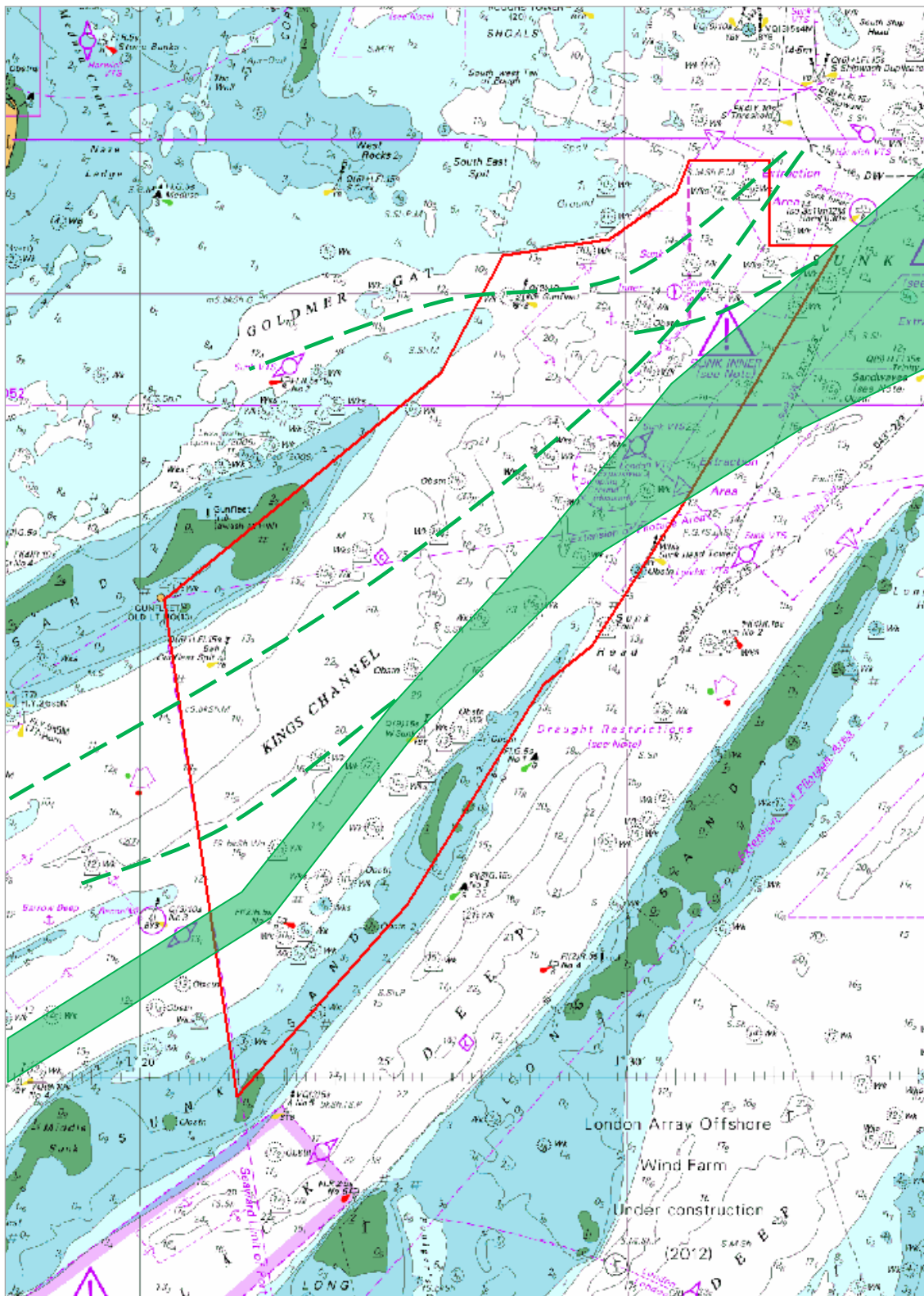
REPORTS: 1986 Latest survey included K9045 (H0423/86)
2000 latest survey included M3352

ASSESSMENTS: None

REMARKS: 1980 Area 7 established. Part of an old area H (H3911/80)
1996 Dredging in this area (HA242/168/06 E22).
2000 COSH meeting (Oct 2000) merger of TE7 and TE3 South agreed.

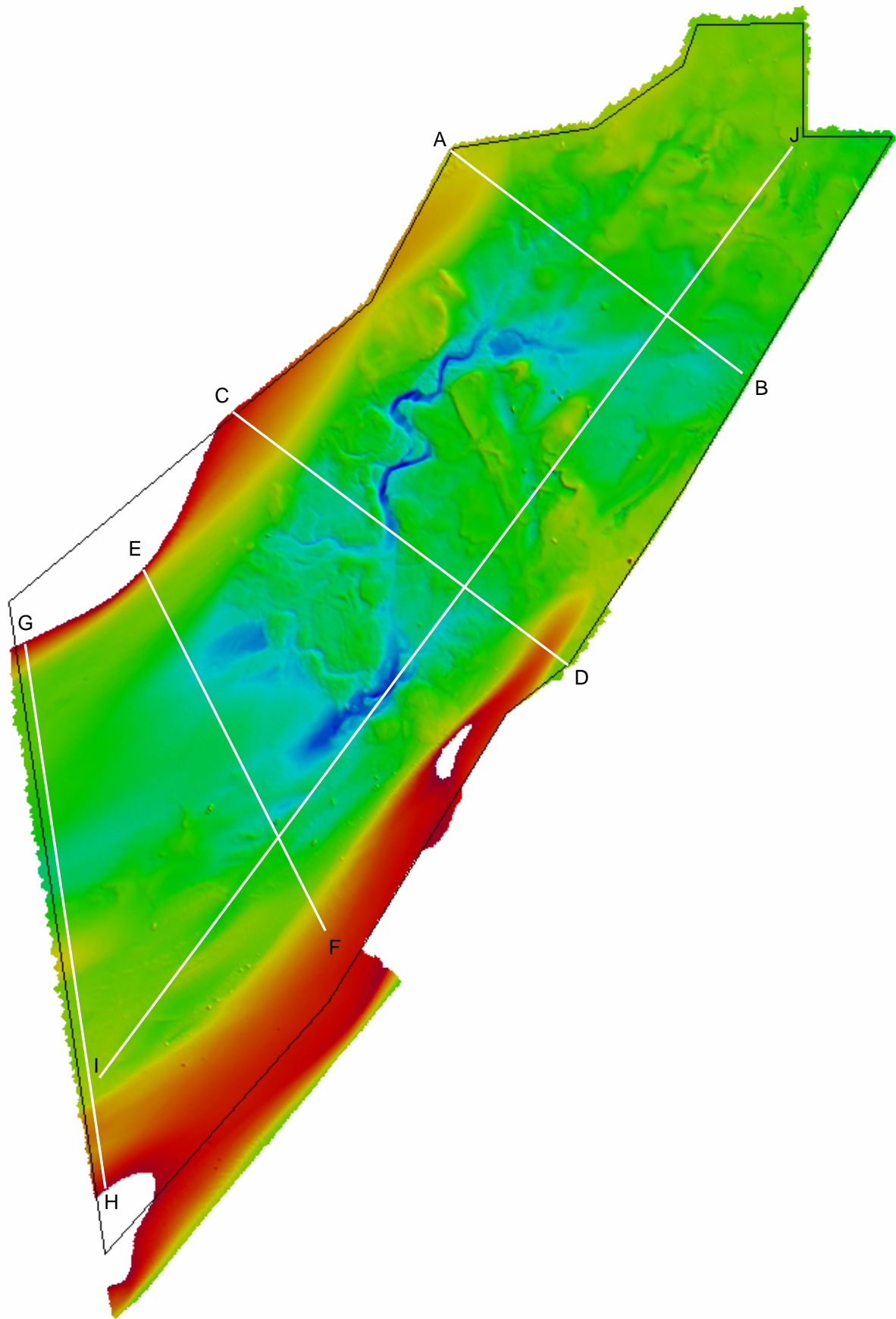
LARGEST SCALE CHART: BA 1975 (1:50,000)

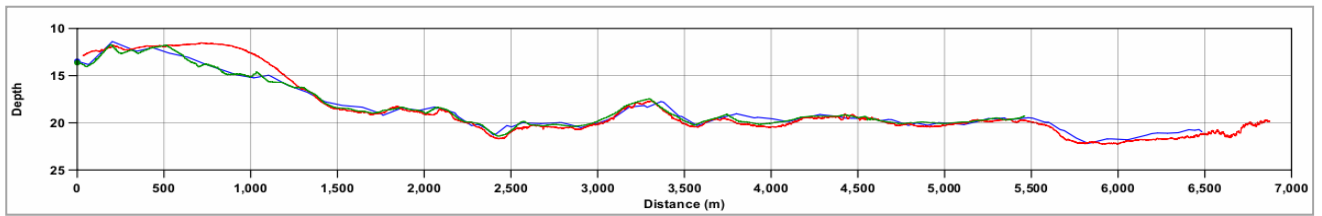
SHIPPING ROUTES



- Main shipping route through area TE7
- Other shipping routes through area TE7

PROFILE COMPARISONS FROM 2008, 2010 & 2012 SURVEYS

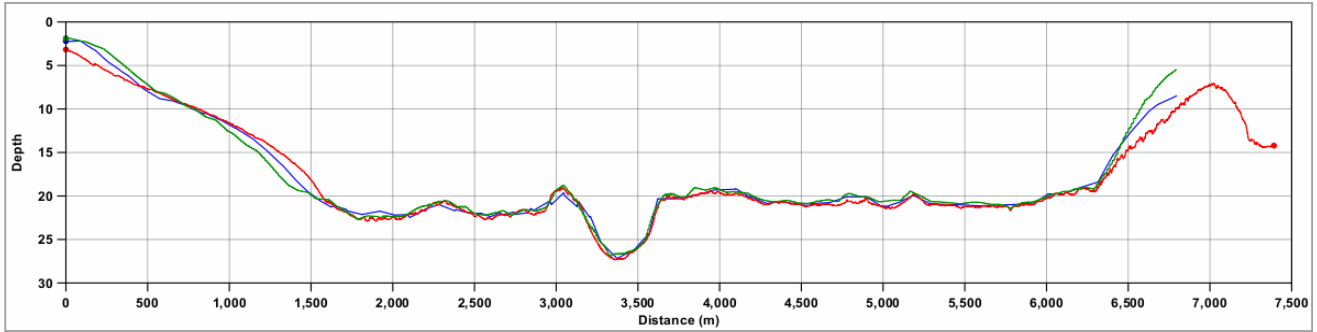




A

Profile A-B

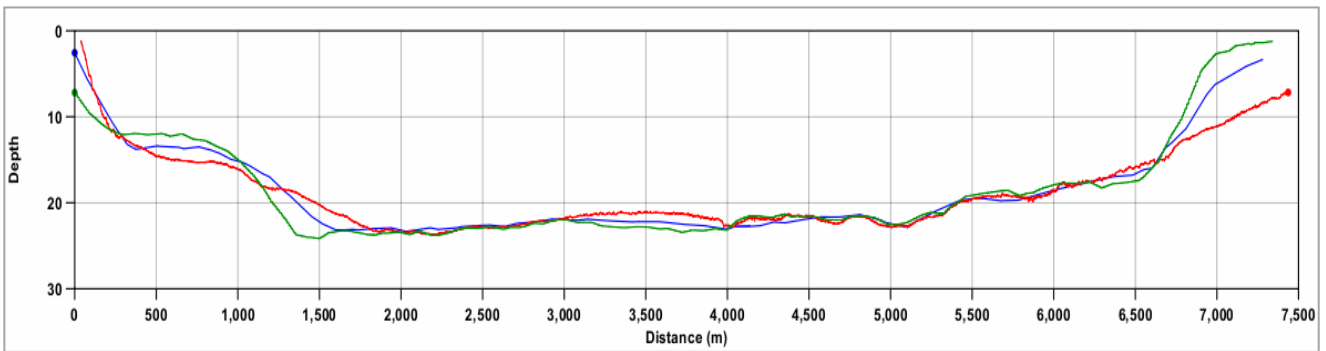
B



C

Profile C-D

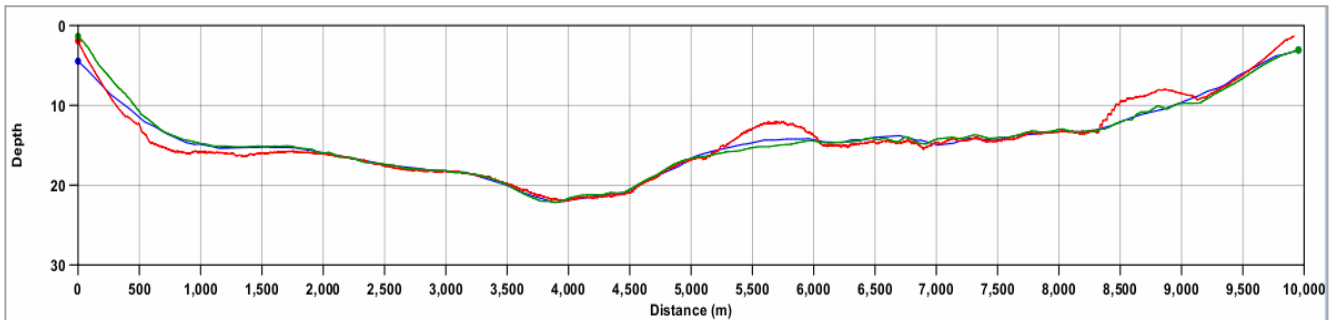
D



E

Profile E-F

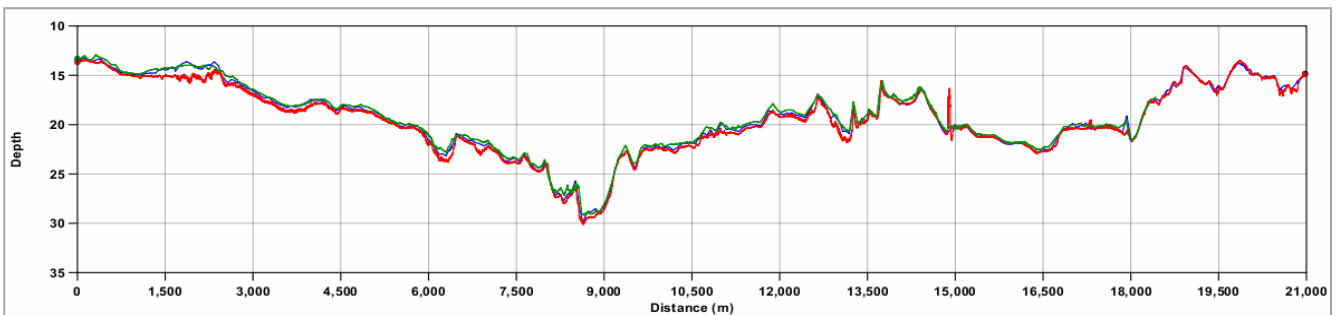
F



G

Profile G-H

H



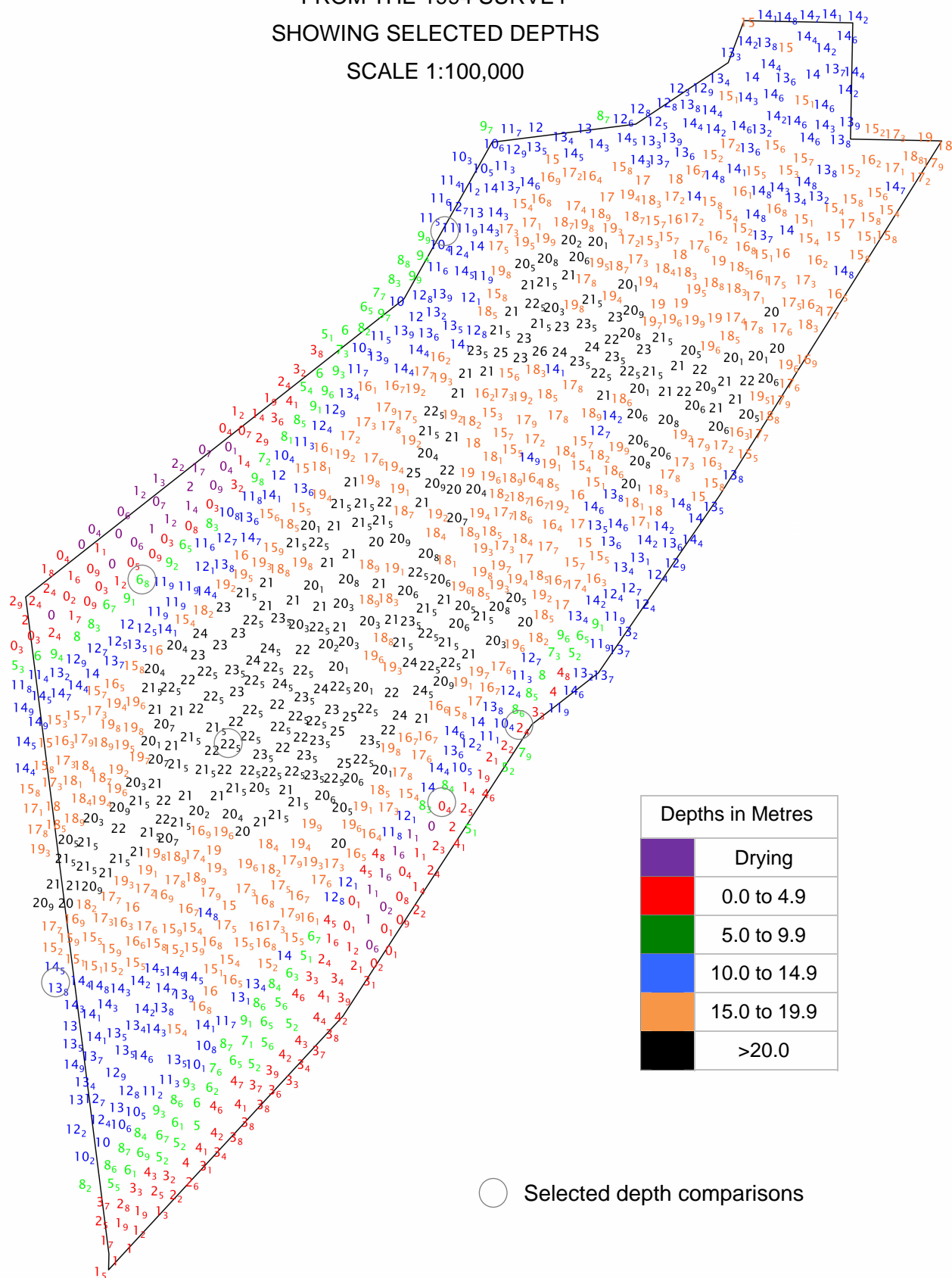
I

Profile I-J

J

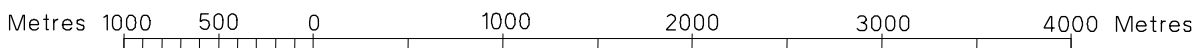
— 1994 — 2000 — 2012

COLOUR BANDED DEPTH PLOT
 FROM THE 1994 SURVEY
 SHOWING SELECTED DEPTHS
 SCALE 1:100,000

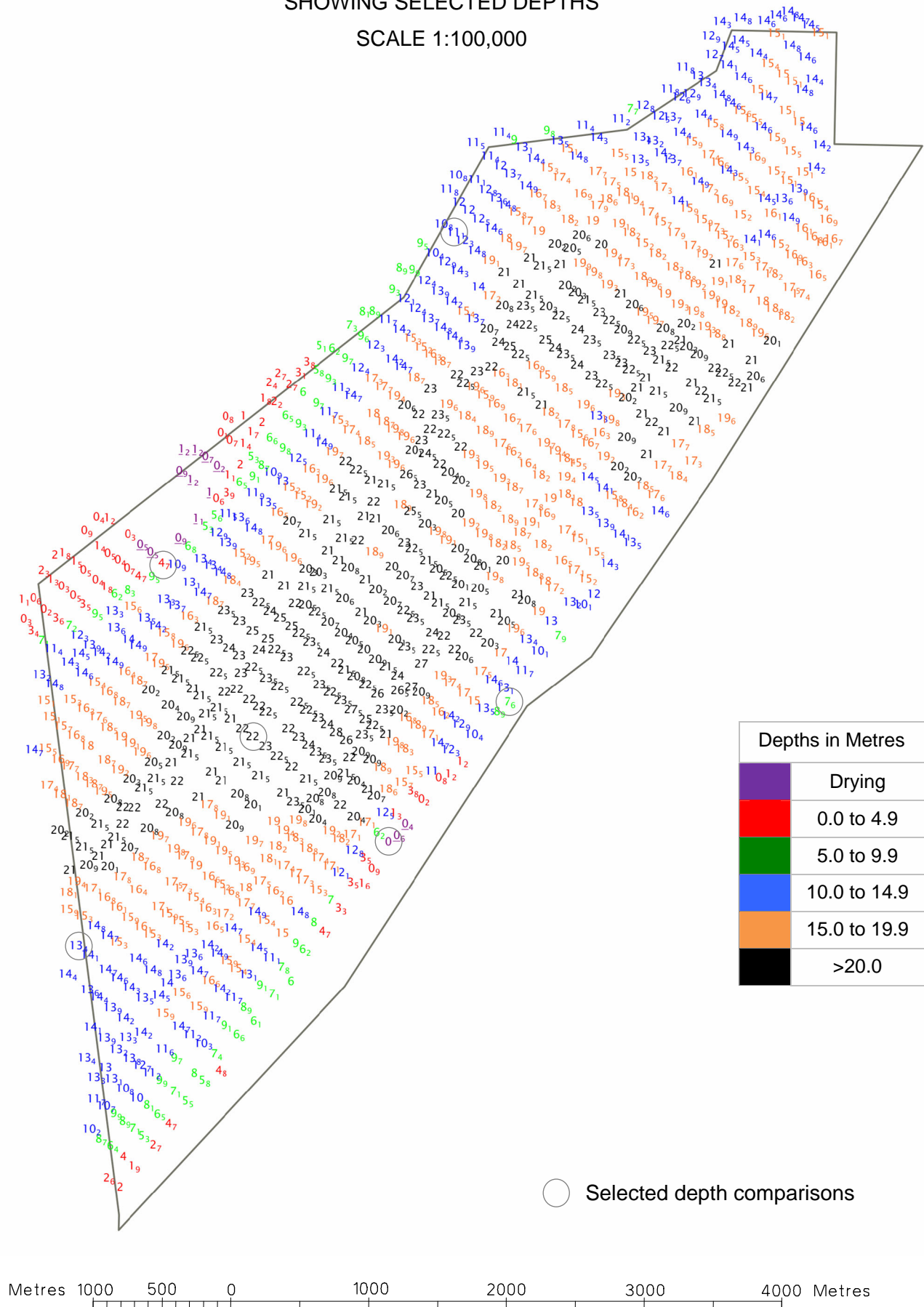


Depths in Metres	
	Drying
	0.0 to 4.9
	5.0 to 9.9
	10.0 to 14.9
	15.0 to 19.9
	>20.0

○ Selected depth comparisons



COLOUR BANDED DEPTH PLOT
 FROM THE 2000 CHECK-LINE SURVEY
 SHOWING SELECTED DEPTHS
 SCALE 1:100,000

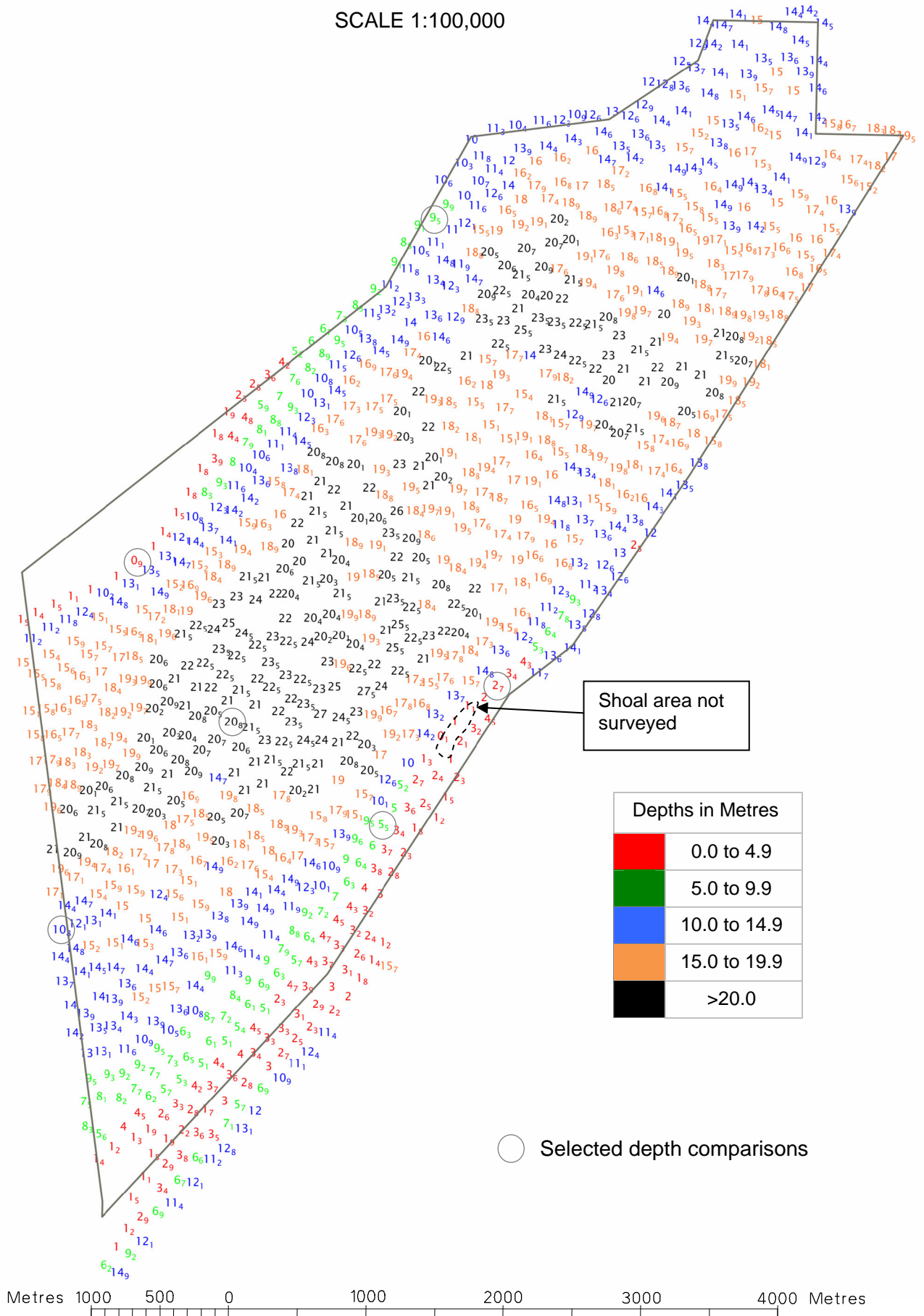


Depths in Metres	
	Drying
	0.0 to 4.9
	5.0 to 9.9
	10.0 to 14.9
	15.0 to 19.9
	>20.0

○ Selected depth comparisons



COLOUR BANDED DEPTH PLOT
 FROM THE 2012 SURVEY
 SHOWING SELECTED DEPTHS
 SCALE 1:100,000

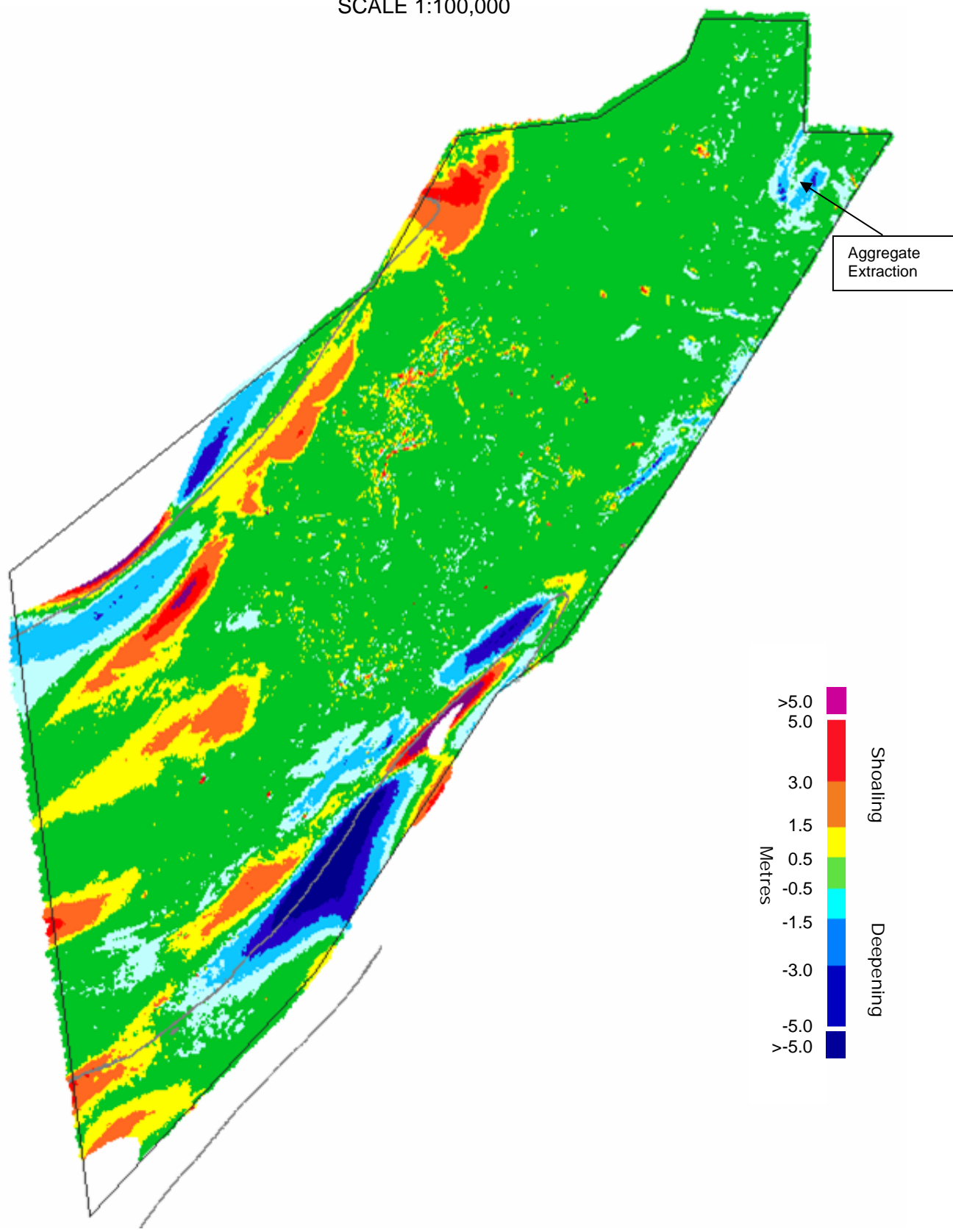


Shoal area not surveyed

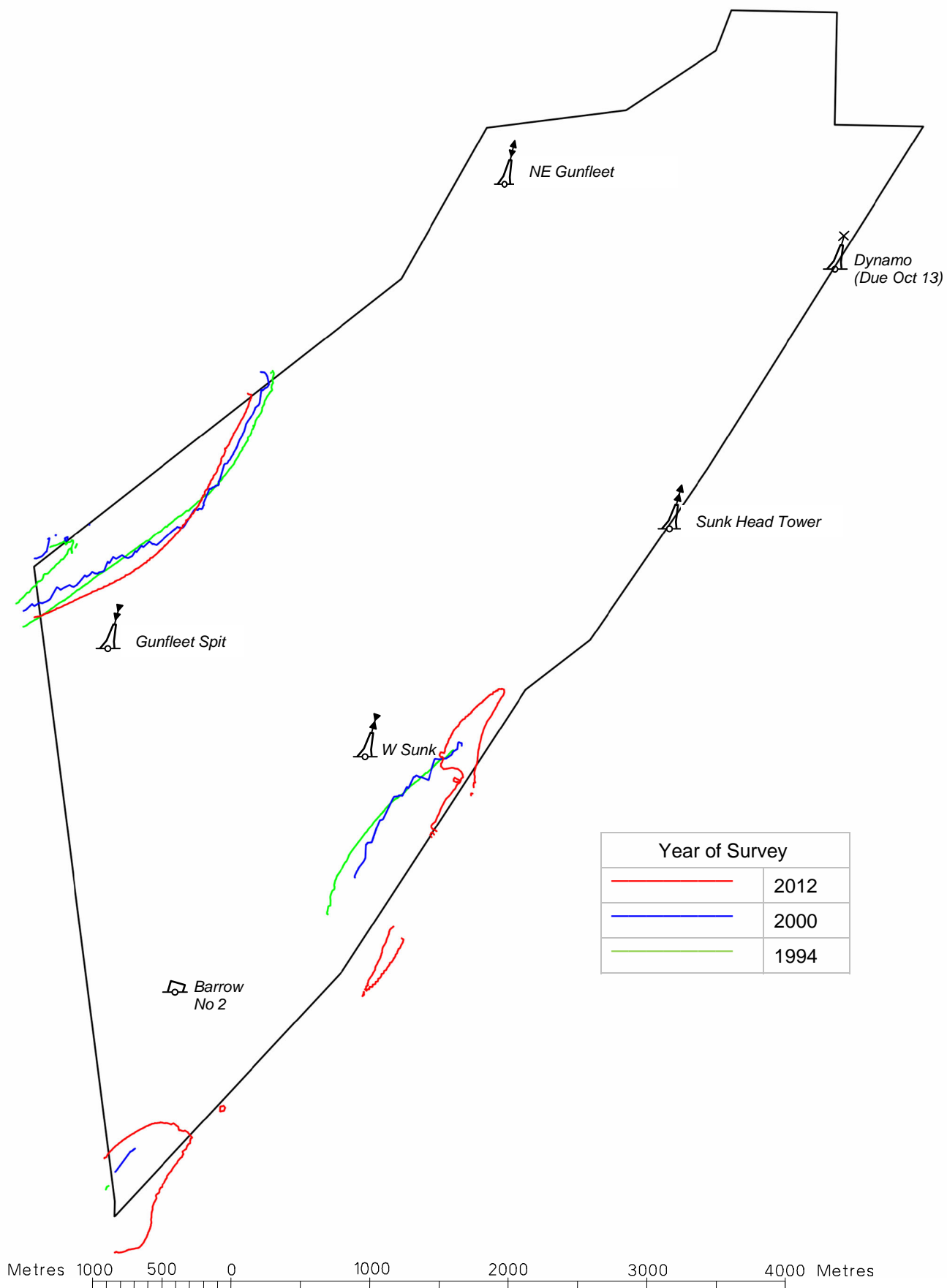
Depths in Metres	
	0.0 to 4.9
	5.0 to 9.9
	10.0 to 14.9
	15.0 to 19.9
	>20.0

○ Selected depth comparisons

VARIABILITY PLOT SHOWING
BATHYMETRIC CHANGES BETWEEN THE 1994 AND 2012 SURVEYS
AND 10 METRE CONTOUR FROM THE 2012 SURVEY
SCALE 1:100,000

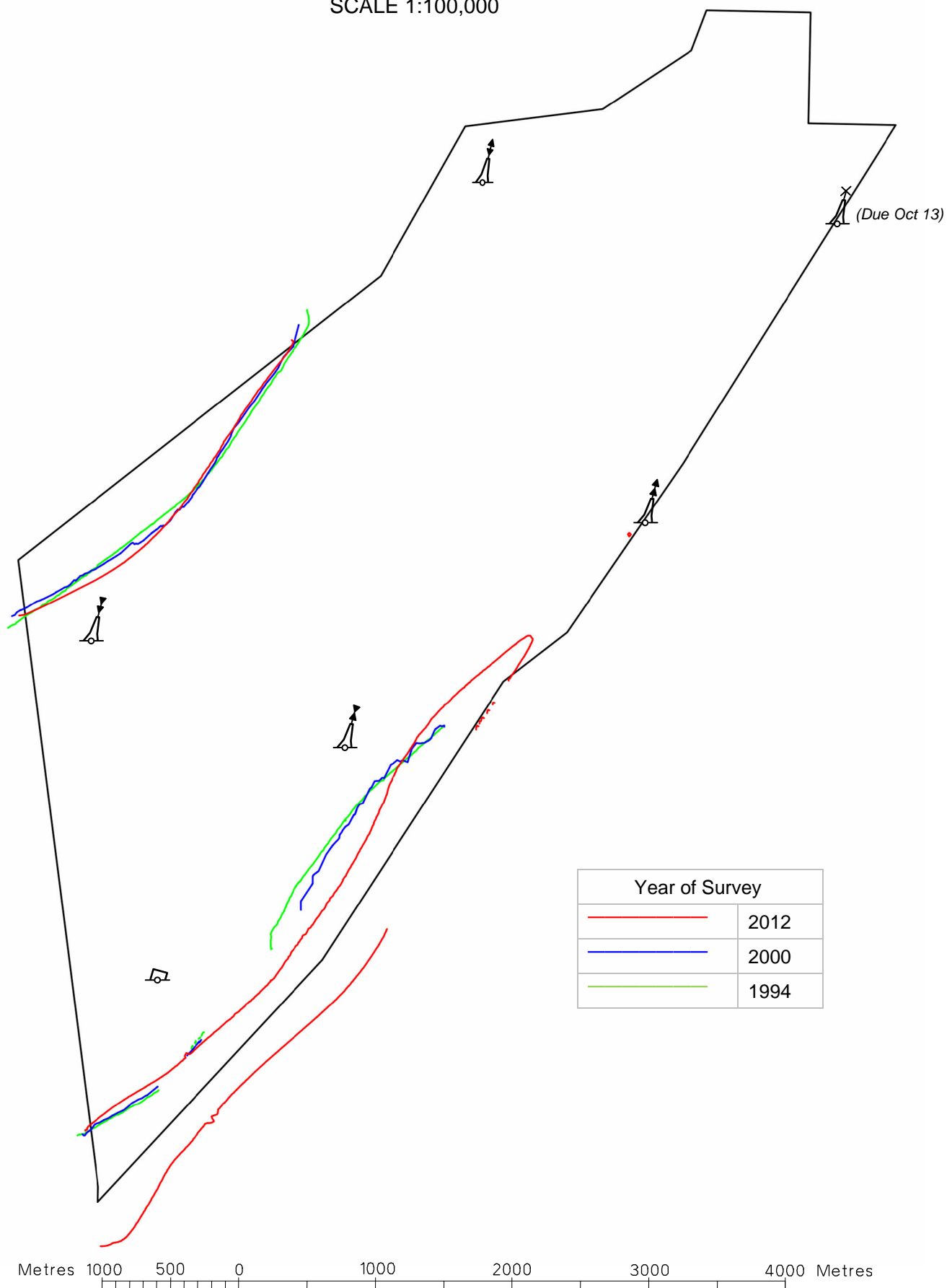


COMPOSITE DIAGRAM OF THE
2 METRE CONTOUR FROM THE 1994, 2010 AND 2012 SURVEYS
SCALE 1:100,000

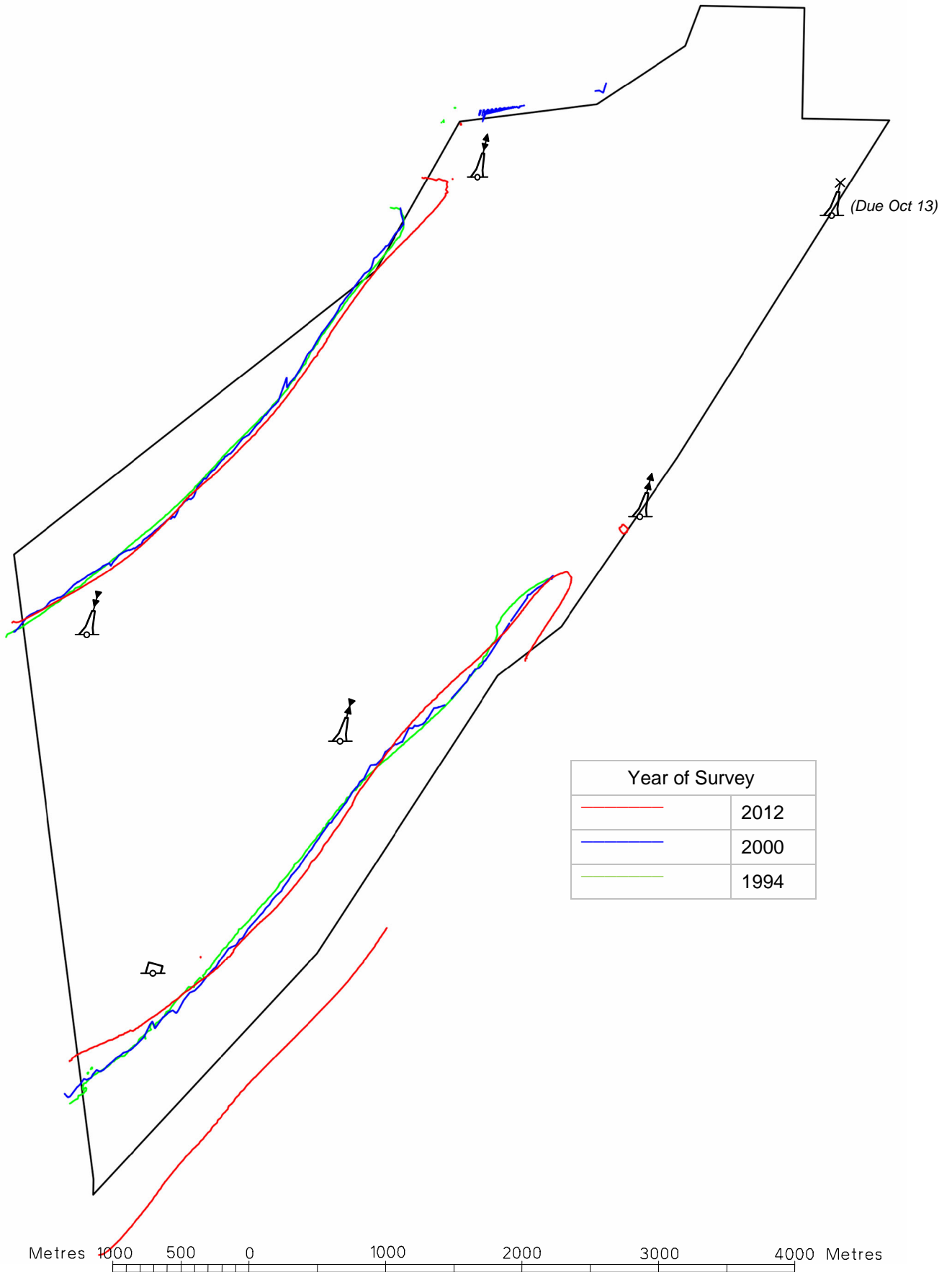


COMPOSITE DIAGRAM OF THE
5 METRE CONTOUR FROM THE 1994, 2000 AND 2012 SURVEYS

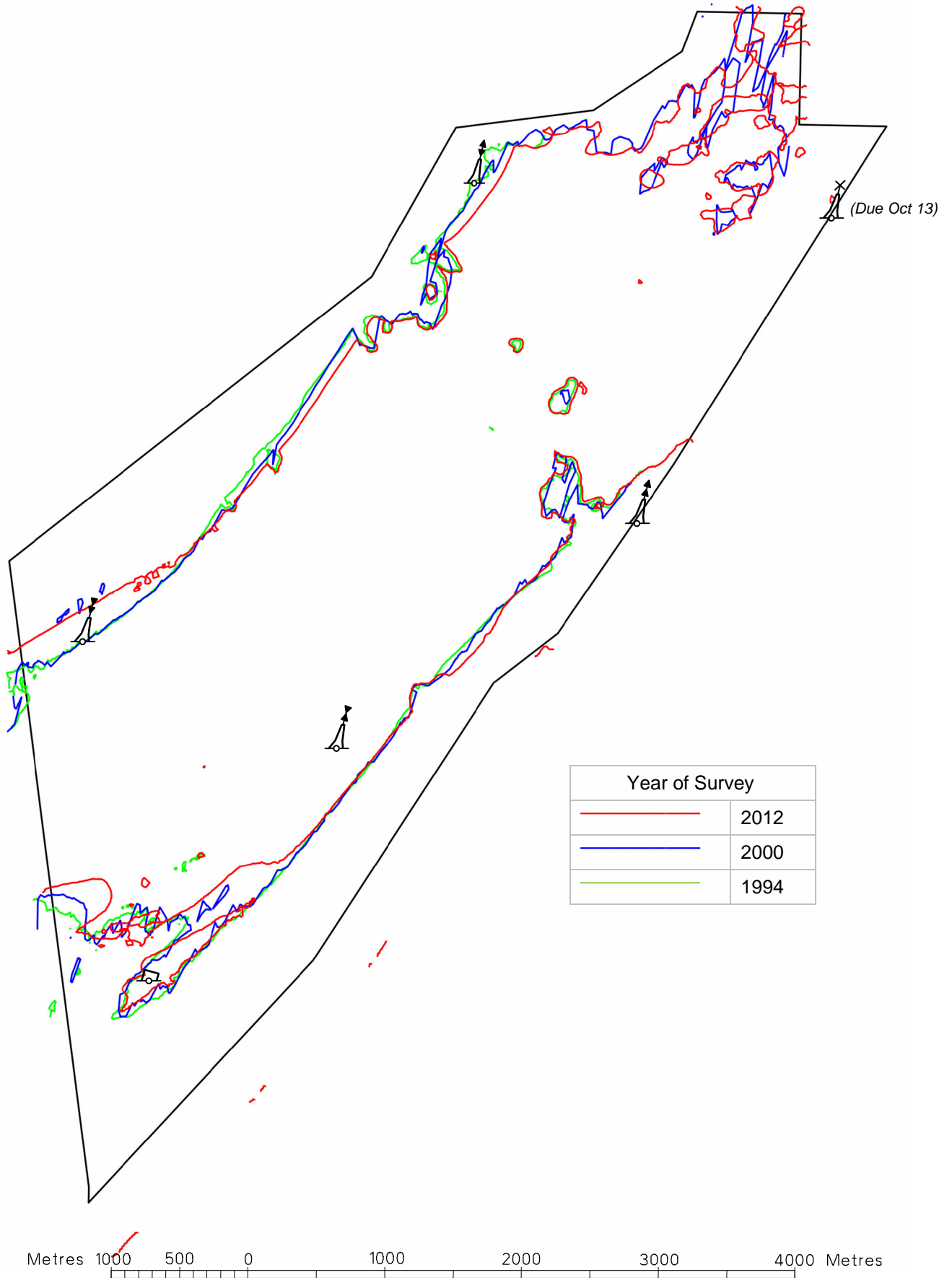
SCALE 1:100,000



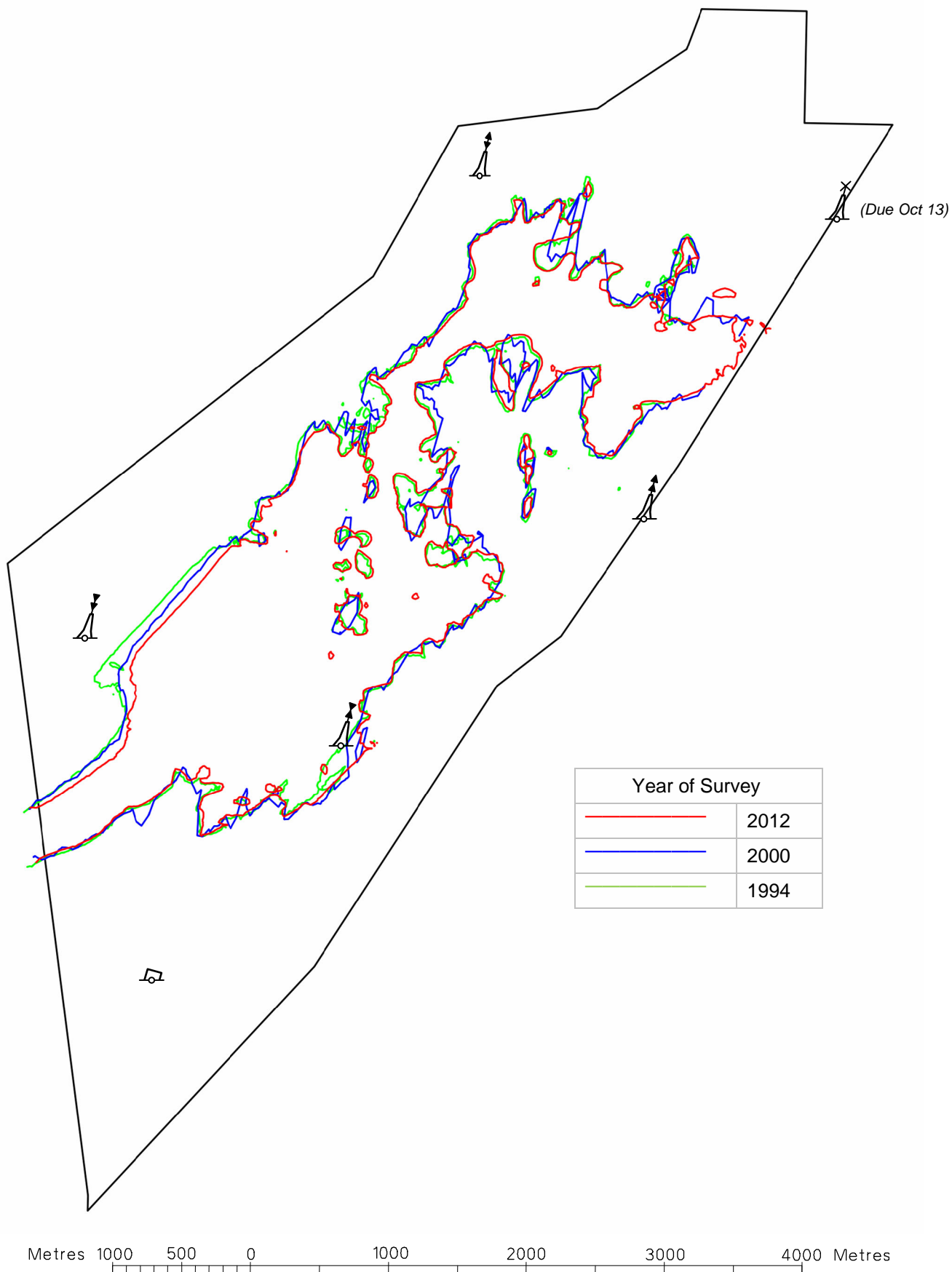
COMPOSITE DIAGRAM OF THE
 10 METRE CONTOUR FROM THE 1994, 2000 AND 2012 SURVEYS
 SCALE 1:100,000



COMPOSITE DIAGRAM OF THE
15 METRE CONTOUR FROM THE 1994, 2000 AND 2012 SURVEYS
SCALE 1:100,000



COMPOSITE DIAGRAM OF THE
20 METRE CONTOUR FROM THE 1994, 2000 AND 2012 SURVEYS
SCALE 1:100,000



PROPOSED REVISED LIMITS

