

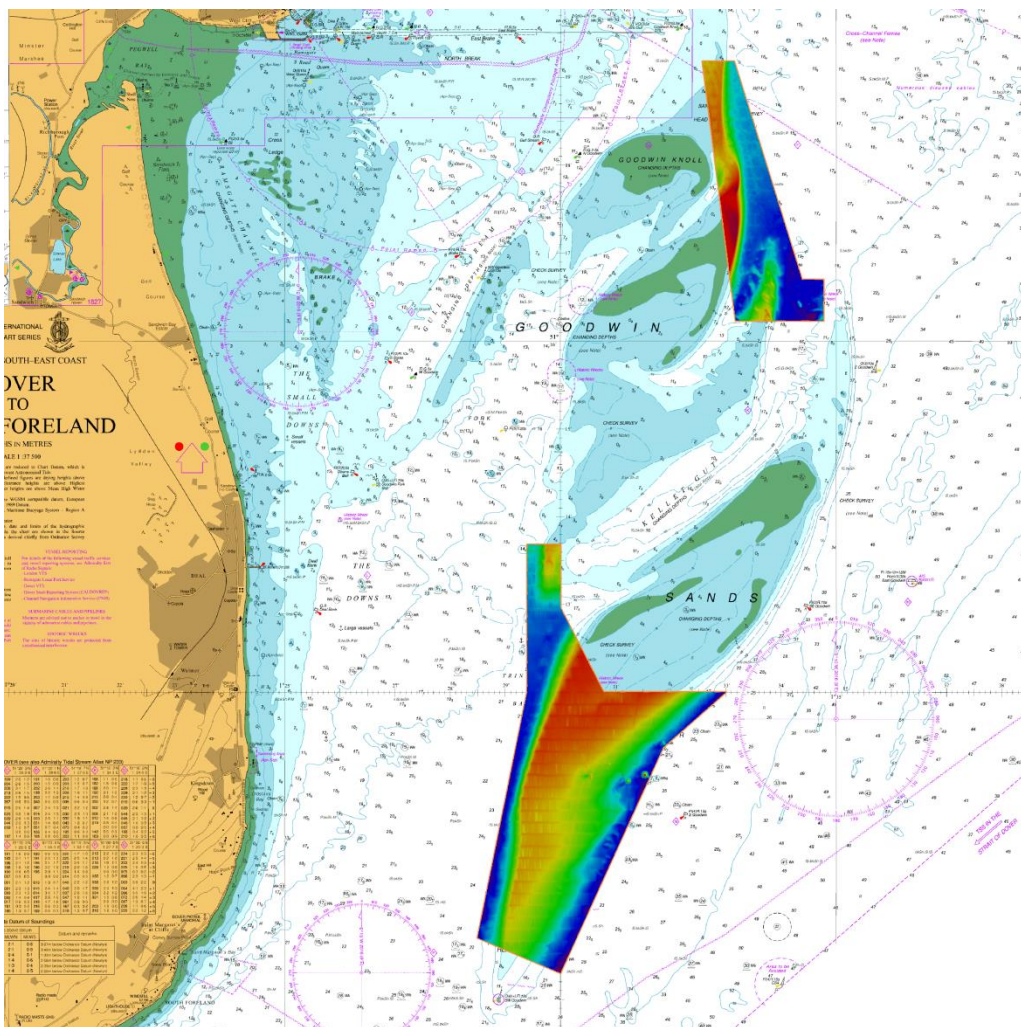


United Kingdom  
Hydrographic Office

## GOODWIN SANDS

### SOUTH CALLIPER & GOODWIN KNOLL

SUMMARY ASSESSMENT ON THE ANALYSIS OF THE  
FOCUSED ROUTINE RESURVEY AREA GS4 FROM THE 2015 SURVEY



ENGLAND – GOODWIN SANDS  
SOUTH CALLIPER - GS4A AND GOODWIN KNOLL - GS4B  
Summary Assessment GS4 2015

A summary 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.

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## **SOUTH CALLIPER AND GOODWIN KNOLL, 2015**

### **1 INTRODUCTION**

- 1.1 This Assessment is produced by the United Kingdom Hydrographic Office (UKHO) for the Maritime and Coastguard Agency (MCA).
- 1.2 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).
- 1.3 The full GS4 area is fully surveyed every 12 years, with 3 and 6 year check-line surveys run over selected areas. The 2015 survey of the **South Calliper** was surveyed as a 3 year open spaced check-line survey and 2105 survey of **Goodwin Knoll** was as a 6 year open spaced check-line survey, with lines in both cases run at 250 metres.
- 1.4 For more details on the area, including long-term changes, the more detailed report on the last full 12-year survey of area GS4, conducted in 2009, should be consulted.

### **2 DESCRIPTION OF THE AREAS**

- 2.1 The **South Calliper** focused area covers the southern part of Goodwin Sands as far south as South Sand Head, which is covered by area GS1. The bank is marked by Southeast Goodwin and Southwest Goodwin buoys. Trinity Bay immediately to the west provides sheltered anchorage for large draught vessels and Trinity Bay and The Downs provides a waiting area for ferry traffic in the event of the Port of Dover being closed.
- 2.2 The **Goodwin Knoll** focussed area covers the area to the east of the knoll itself in the north eastern section of the Goodwin Sands. Deeper water to the north and east of the survey area is used by shipping and including cross channel ferries.

### **3 SURVEY DATA**

- 3.1 The 2009 survey HI1294 of all the Goodwin Sands re-survey areas was conducted from 23<sup>rd</sup> July to 1<sup>st</sup> September. The 2012 survey HI1399 of South Calliper was mainly conducted on 13<sup>th</sup> and 14<sup>th</sup> December, with survey work completed on 16<sup>th</sup> and 18<sup>th</sup> December following interruptions due to weather. The latest 2015 check line survey HI1484 of both areas was conducted between the 28<sup>th</sup> August to the 9<sup>th</sup> September.
- 3.2 In all surveys assessed in this report the Vertical Offshore Reference Frame (VORF) and GPS heighting were used to reduce depths to Chart Datum. The surveys HI1294 and HI1399 have been validated by UKHO as being of IHO S44 standard Order 1a (5<sup>th</sup> Edition). With reference to the check line survey undertaken as part of HI1484 the depth and position uncertainty of soundings was in accordance with IHO S44 standard Order 1a (5<sup>th</sup> Edition).

### **4 CHANGES SINCE THE PREVIOUS SURVEYS**

#### **Goodwin Knoll:**

- 4.1 The variability plot in Annex C-1 shows the changes in depth that have occurred since the last survey. This shows a general deepening to the north and east, shoaling to the near west and deepening in the far west. The blank area in the mid-west of the variability plot is

indicative of the deepening since the 2009 survey as in 2009 the contractor was unable to survey that section due to water depths of less than 1 metre.

4.2 Depth plots of the 2009 and 2015 surveys are shown in Annexes E and F respectively and allow a comparison of depth values which are summarised below:

- a) The minimum depth in the 2015 survey within the Goodwin Knoll area limits is 0.62 metres drying over a sand ridge in the west of the area, 14.9 metres shoaler than the same point in the 2009 survey.
- b) The selected depth plots indicate a mix of relatively small shoaling and deepening of less than 0.5 metres across the north and east of the survey area. However to the south and west it shows more significant change has occurred with shoaling of up to 15 metres as mentioned above in the near west and deepening in the far west by up to 5m.

4.3 Historical surveys have shown an easterly migration of the sand ridge that lies in the west of area, This trend is supported by the variability plot in Annex C-1, cross section profiles in Annex D-1 and contour plots in Annexes I and J in which there assessment is summarised below:

- a) The sand ridge crest towards the north boundary has moved east by up to 75 metres as demonstrated by profile A-B in Annex D-1 and changes in the 5 and 10 metre contours in Annexes I and J.
- b) In the middle section of the same crest, the 10-metre contour (Annex J) is continuing its eastward migration by up to 200 metres. However the 5-metre contour is more complex with a shoaling section in the mid-western area including the 15m change to 0.62 metres drying mentioned above as demonstrated by profile C-D in Annex D-1
- c) The northern end of the ridge that leads to Kellet Gut to the south has receded south by 330 metres (10-metre contour in Annex J) and has deepened as shown in profile E-F in Annex D-1 and with the 5 metre and 10 metre contours reducing in area.

#### **South Calliper:**

4.4 The variability plot in Annex C-2 shows the changes in depth that have occurred since the 2012 survey. The Annex also includes the southern section which was not covered in the 2012 survey and shows the changes in depth since the 2009 survey. The variability plot shows little change across the area with the exception of a section of some more significant deepening on the western side.

4.5 Depth plots of the 2012 (plus the 2009 extract) and 2015 surveys are shown in Annexes G and H respectively and allow a comparison of depth values which are summarised below.

- a) The minimum seabed depth (disregarding the mast of the wreck charted at 2.5m drying) in the 2015 survey within the South Calliper area limits is 0.1 metres towards the north west of the area, 1.2 metres shoaler than in the same point in the 2012 survey.
- b) The selected depth plots indicate a mix of relatively small shoaling and deepening of less than 3 metres across the majority of the survey area. However to the north west of the area some more significant change has occurred with a deepening of up to 8 metres.

4.6 Historical surveys had shown significant westward migration of the South Calliper bank up to 2009. The migration is then shown to have ceased in the 2012 survey which also showed that the bank had begun to narrow as the eastern extents move westwards by 60 to 540 metres over 3 years. The variability plot in Annex C-2, cross section profiles in Annex D-2 and 10-metre contour plot in Annex K generally show no significant migration of the bank with the exception of the southernmost extent of the ridge. The 2015 survey

has showed the continued narrowing of the bank at a reduced rate of 60 to 300m over 3 years from that reported in the 2012 assessment additional details given below:

- a) To the north, the western slope of the ridge has moved east by up to 150 metres but the eastern edge the ridge has not moved. The ridge has steepened as demonstrated by profile G-H in Annex D-2 and changes in the 5 and 10 metre contours in Annexes K and L.
- b) Towards the southern section of the ridge there has been little movement of the western edge with the eastern edge of the ridge receding up to 300m to the west as demonstrated by profile I-J in Annex D-2 and the 10-metre contour in Annex K.
- c) In the far southern section 2015 survey data was compared with the 2009 survey as area was not covered in 2012. There is no depth shoaler than 5m in the 2015 survey data. The western side of the ridge at the southern limit of the survey area has moved westward by up to 350m since the 2009 survey as demonstrated by profile K-L in Annex D-2 and the 10m contour in Annex K. Given this it is predicated that the current limits will suffice until 2021.

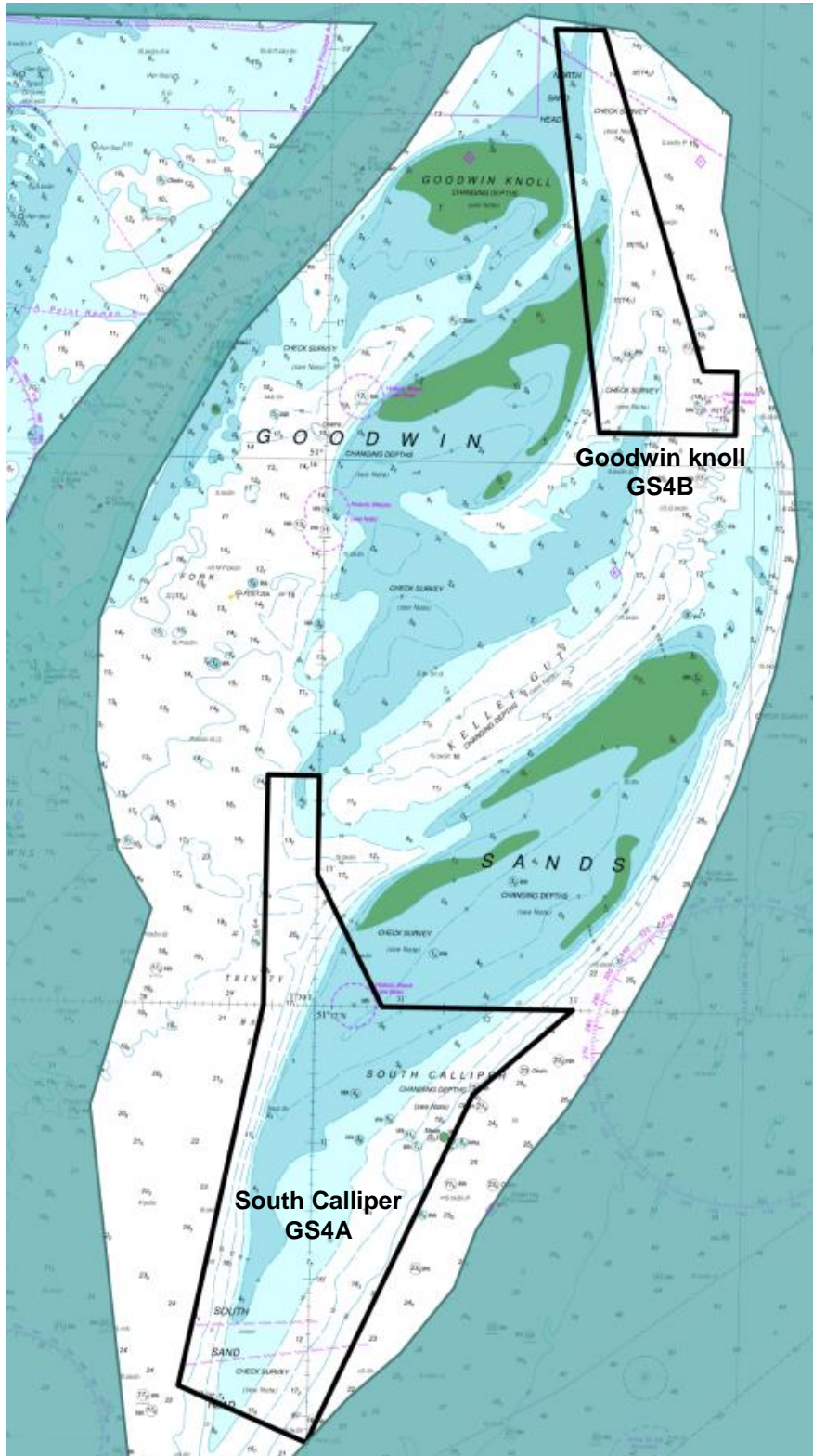
## 5 IMPLICATIONS FOR SHIPPING

- 5.1 Sample shipping data for 2015 shows the no vessels to be transiting through the two survey areas during the period examined. The shipping data showed the typical draught of vessels transiting near the area to be less than 10 metres. The nearest vessel recorded was 150 metres to the east of South Calliper in 25 metres of water. Indicative routes are shown in Annex A. It is therefore considered that the changes noted in these two areas currently have no additional implications for shipping.

## 6 RECOMMENDATIONS

- 6.1 **Goodwin Knoll:** The area limits and interval of the survey should remain unchanged. If further deepening occurs at the southern end of the area by the time of the next focussed survey (2021) then consideration should be given to incorporating this part of the area into the full 12 year GS4 survey area
- 6.2 **South Calliper:** The area limits should remain unchanged and reassessed following the next survey of the area. The continued lack of lateral migration of the bank and the reduction in its size suggest the interval of the survey for this area should be increased from 3 years to 6 years with the next survey in 2021 as part of the currently scheduled full area survey. If this recommendation is followed then the next focused survey of this area will be 2027.
- 6.3 **Goodwin Sands GS4:** As a part of the separate GS1 South Sand Head (GS1/2015) and GS3 Northern Head of South Calliper (GS3/2015) Routine Resurvey assessments, additional minor revisions have been recommended to the GS4 area. This are illustrated in Annex L.

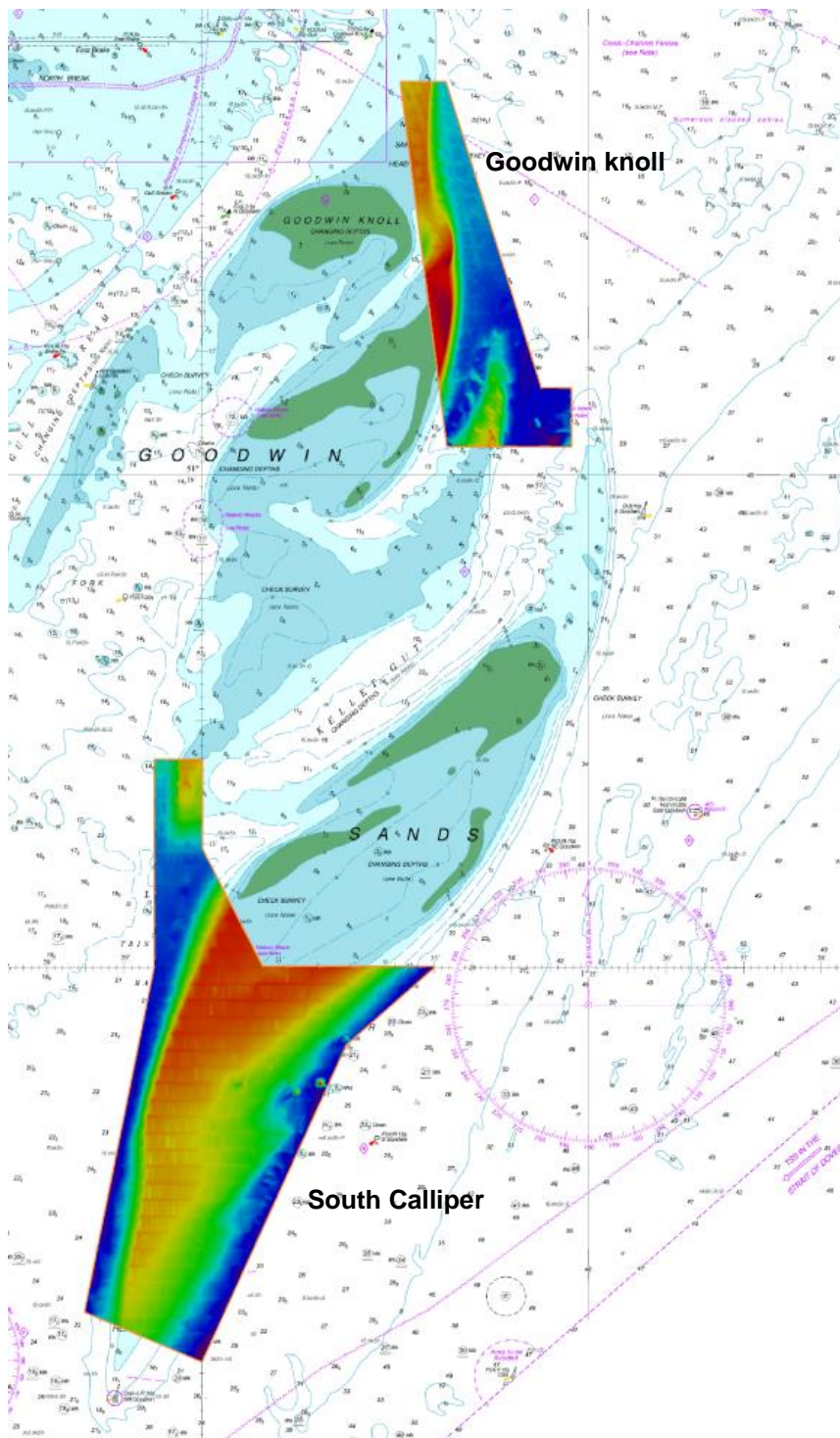
SHIPPING ROUTE



- Limits of GS3A and GS3B survey area
- Indicative shipping routes through the area

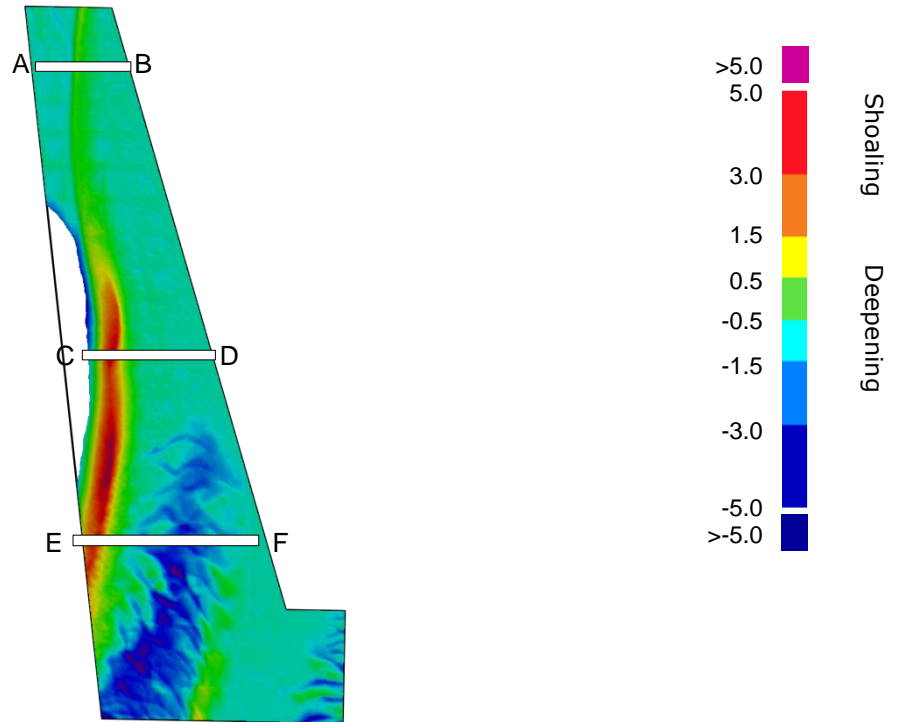
Note: Data from satellite AIS data for FY2015/2016 of vessels larger then 2000GT

2015 SURVEY DATA OVERLAID ON CHART 1828

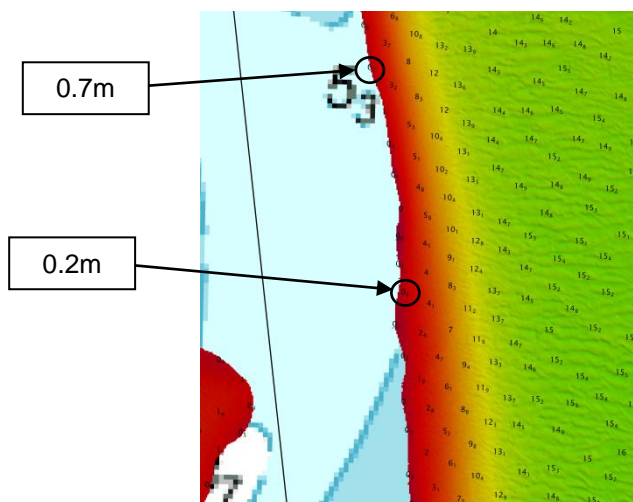




VARIABILITY PLOT SHOWING BATHYMETRIC CHANGES:  
 FOR GOODWIN KNOLL BETWEEN THE 2009 AND 2015 SURVEYS  
 WITH LOCATIONS OF CROSS SECTION COMPARISONS  
 (Shown at Annex D-1)

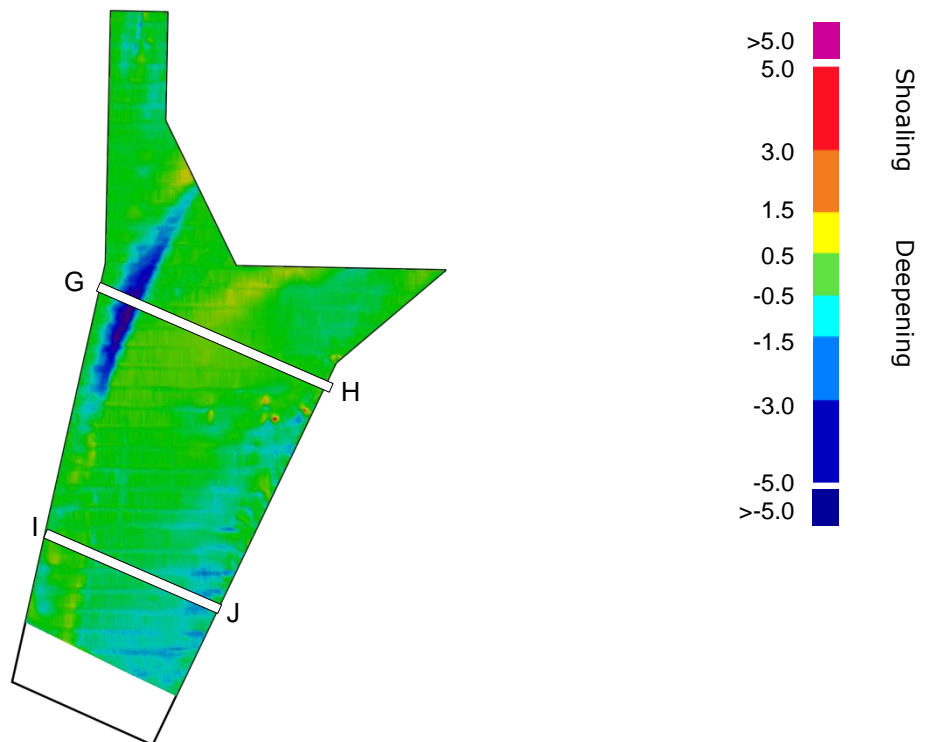


NOTE: The gap within the western side of the survey area boundary is due to the fact that at the time of the 2009 survey, the area was much shallower than for the 2015 survey and it was not possible to survey that area. Implications of this are discussed in 4.1 above (page 1 and 2). The image below is an extract of the 2009 surface with soundings overlaid to show how shoal that area was.

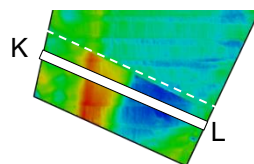


VARIABILITY PLOT SHOWING BATHYMETRIC CHANGES  
FOR SOUTH CALLIPER BETWEEN 2012 AND 2015 SURVEYS  
WITH LOCATIONS OF CROSS SECTION COMPARISONS

(Shown at Annex D-2)



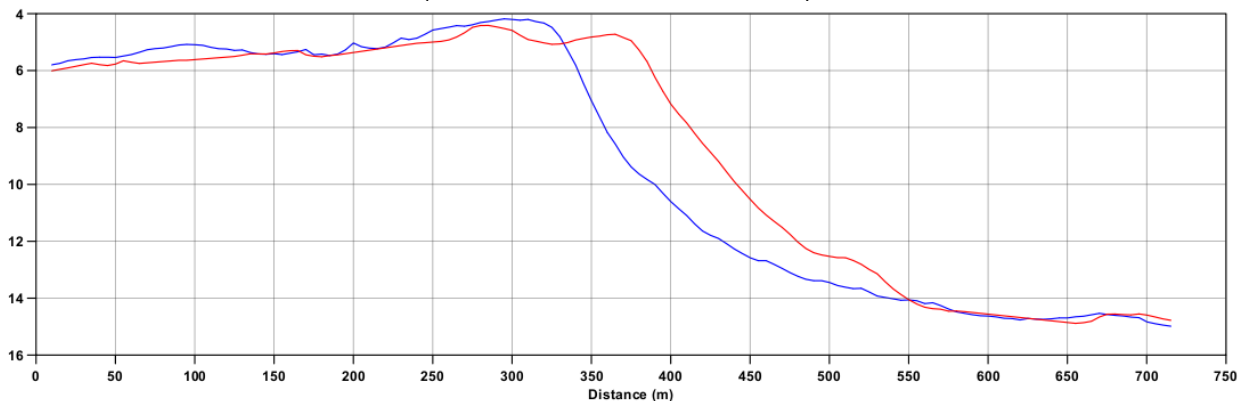
Note: the gap at the southern end of the south calliper survey area is due to the fact that the area was a different size at the time of the 2012 survey. For comparison purposes the earliest previous survey data for this small area was used. The image below shows the variability plot for this area (below the dotted line) between the 2009 and 2015 surveys



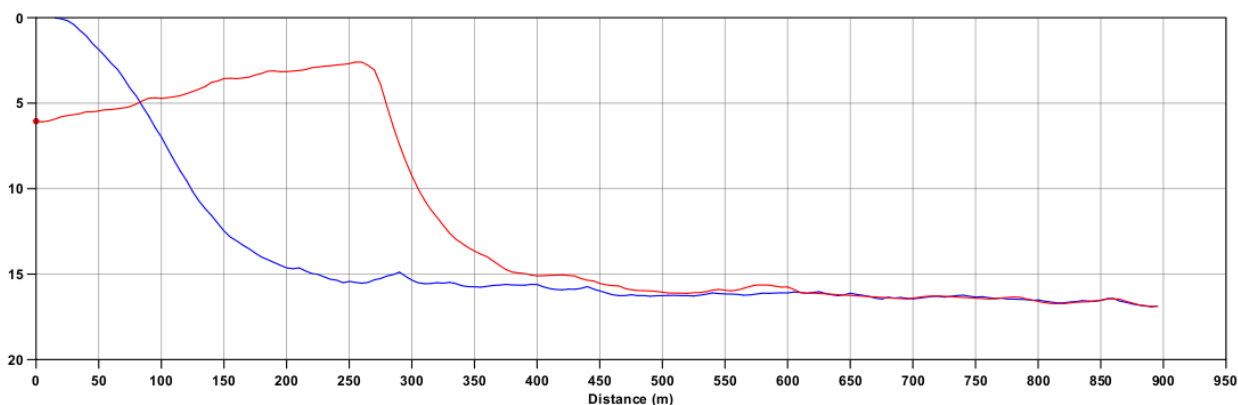
PROFILE COMPARISONS FROM THE 2009 AND 2015 SURVEYS

GOODWIN KNOLL

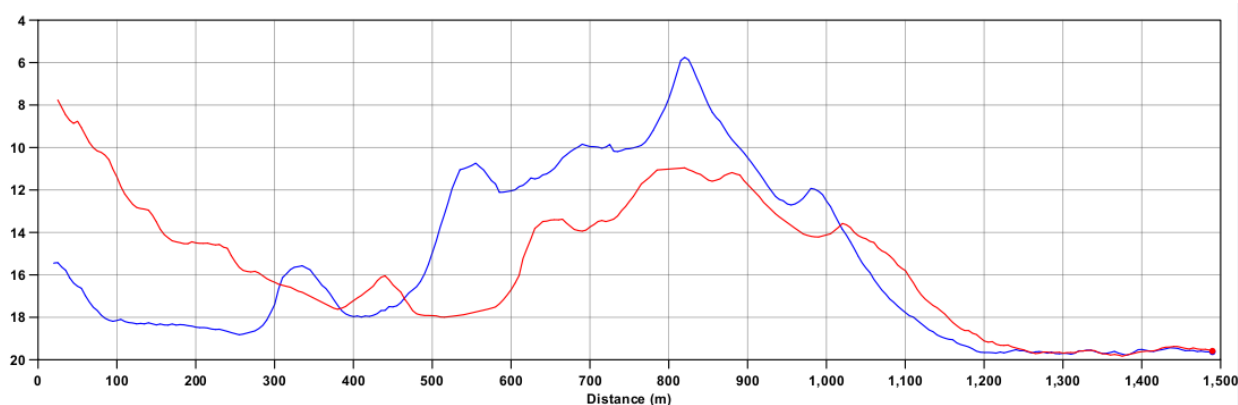
(See Annex C-1 for Locations)



A Profile A-B B



C Profile C-D D



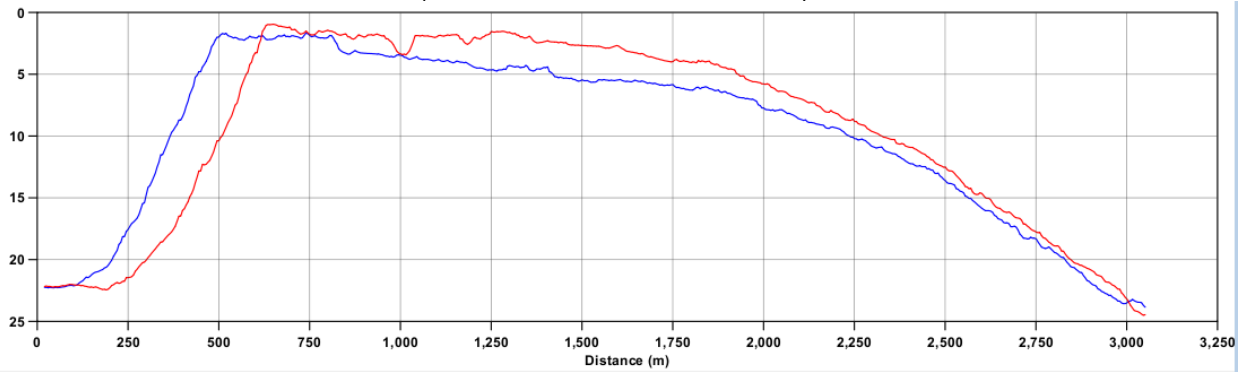
E Profile E-F F

Goodwin Knoll	
	2015
	2009

PROFILE COMPARISONS FROM THE 2009, 2012 AND 2015 SURVEYS

SOUTH CALLIPER

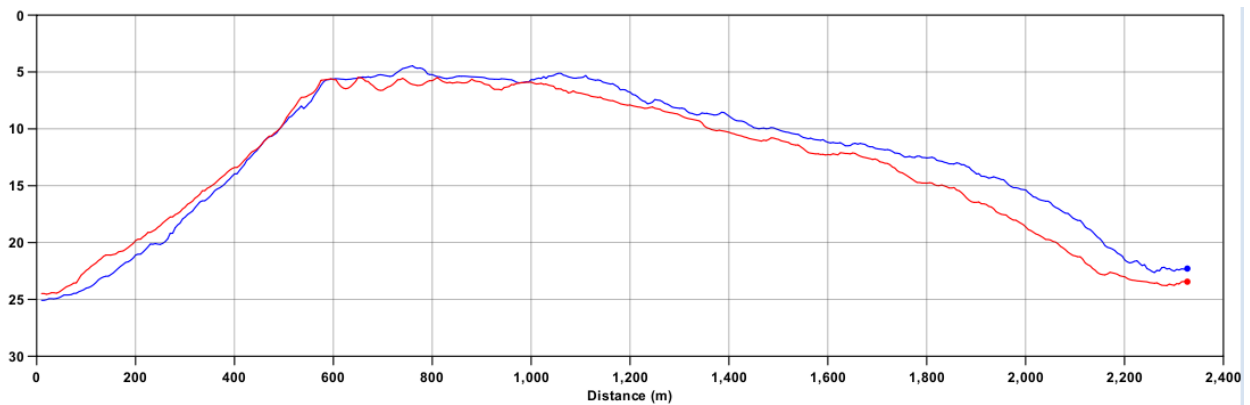
(See Annex C-2 for Locations)



G

Profile G-H



H

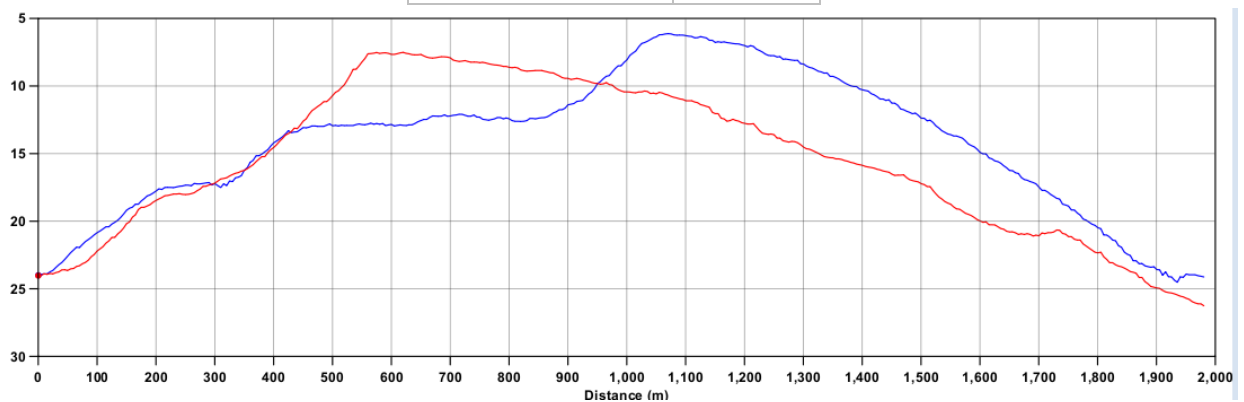


I

Profile I-J

J



South Calliper (G-H and I-J)	
	2015
	2012



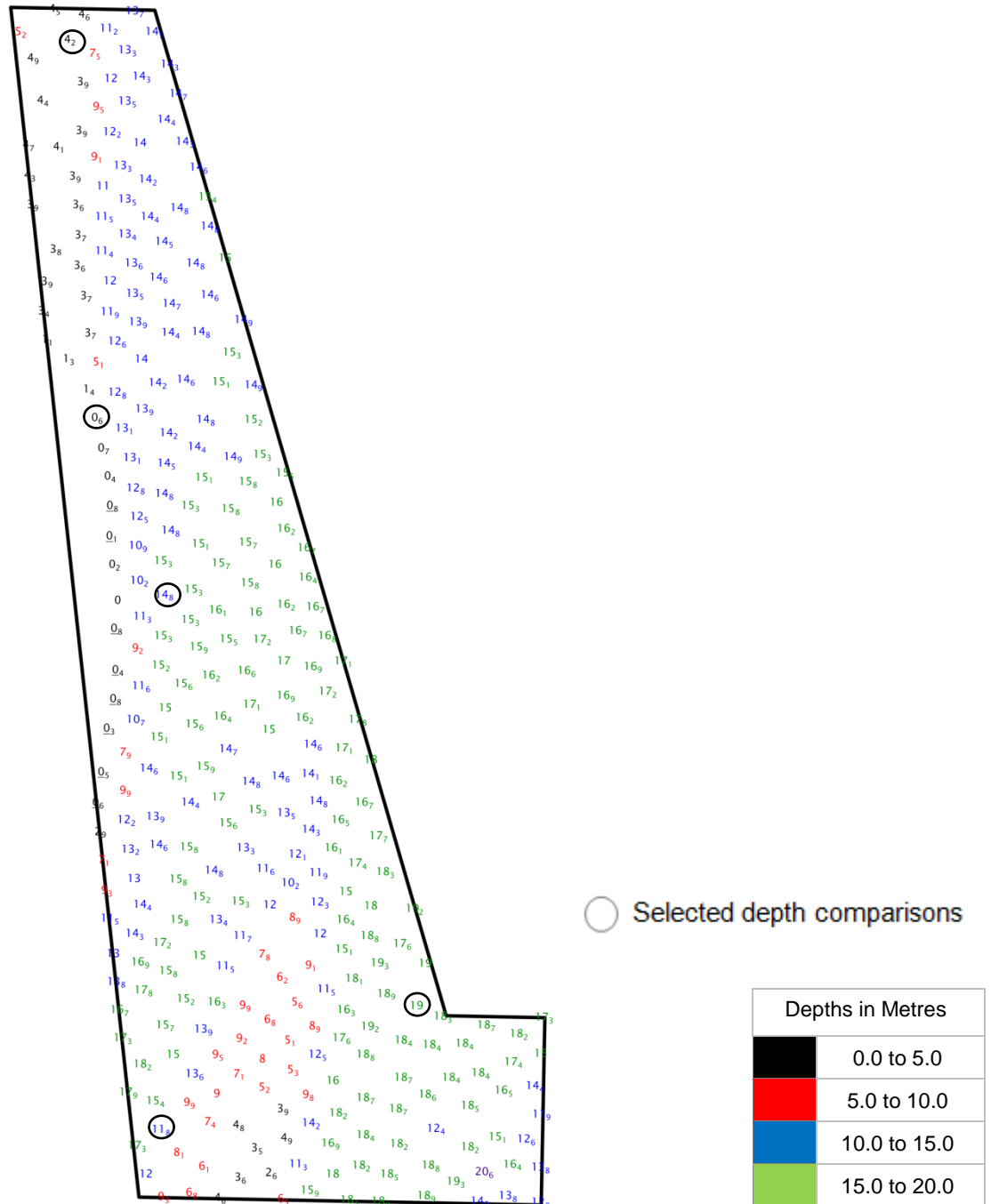
K

Profile K-L

L

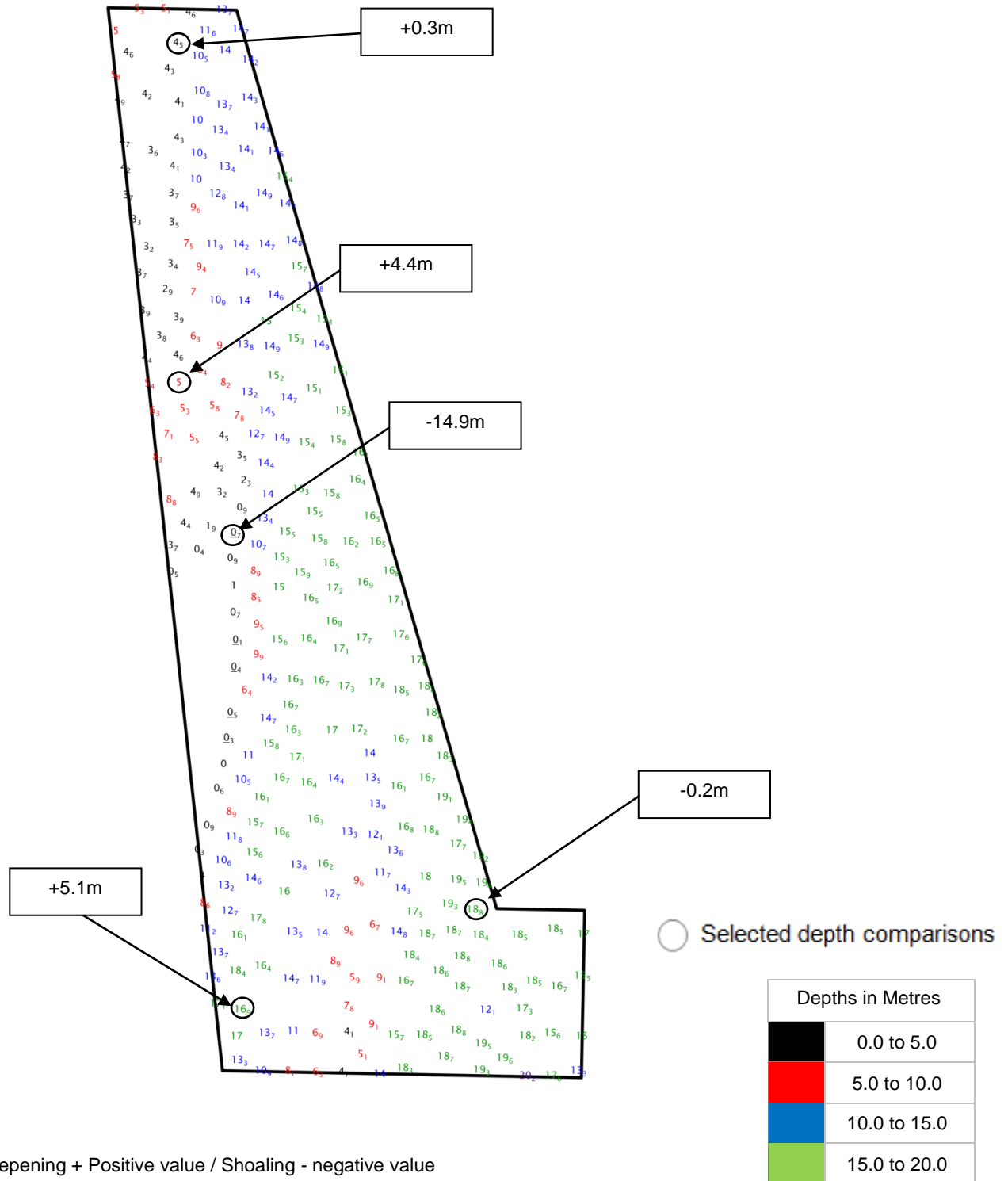
South Calliper (K-L)	
	2015
	2009

COLOUR BANDED DEPTH PLOT FOR GOODWIN KNOLL  
 FROM THE 2009 SURVEY  
 SHOWING SELECTED DEPTHS



Note: Selected depth are from the validated source data and no interpolation has been undertaken

COLOUR BANDED DEPTH PLOT FOR GOODWIN KNOLL  
 FROM THE 2015 SURVEY  
 SHOWING SELECTED DEPTHS



Deepening + Positive value / Shoaling - negative value

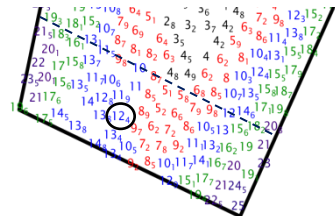
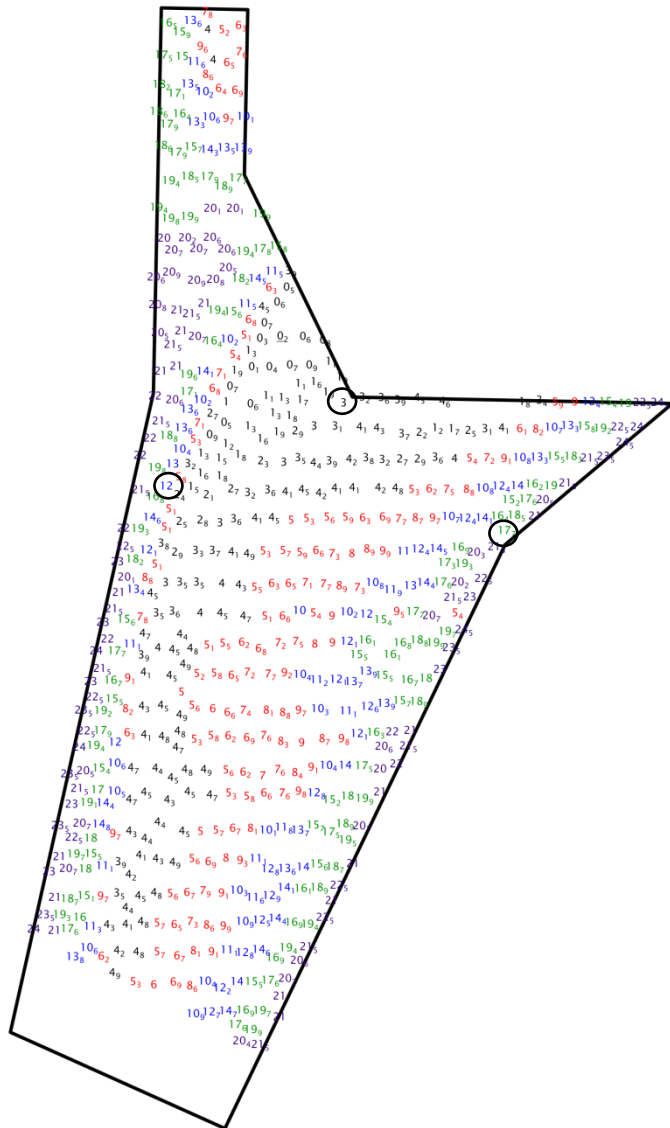
Note: Selected depth are from the validated source data and no interpolation has been undertaken

Note: Depth changes indicated above are from the closest corresponding 2009 sounding available. Hence depth differences will be from different positions from the 2015 sounding selection as an automatic shoal bias sounding selection tool has been utilised which produces a representation of the shoal values in a data set.

COLOUR BANDED DEPTH PLOT FOR SOUTH CALLIPER  
 FROM THE 2012 SURVEY  
 PLUS INSET THE SOUTHERN MOST AREA FROM 2009 SURVEY  
 SHOWING SELECTED DEPTHS

2012 SURVEY

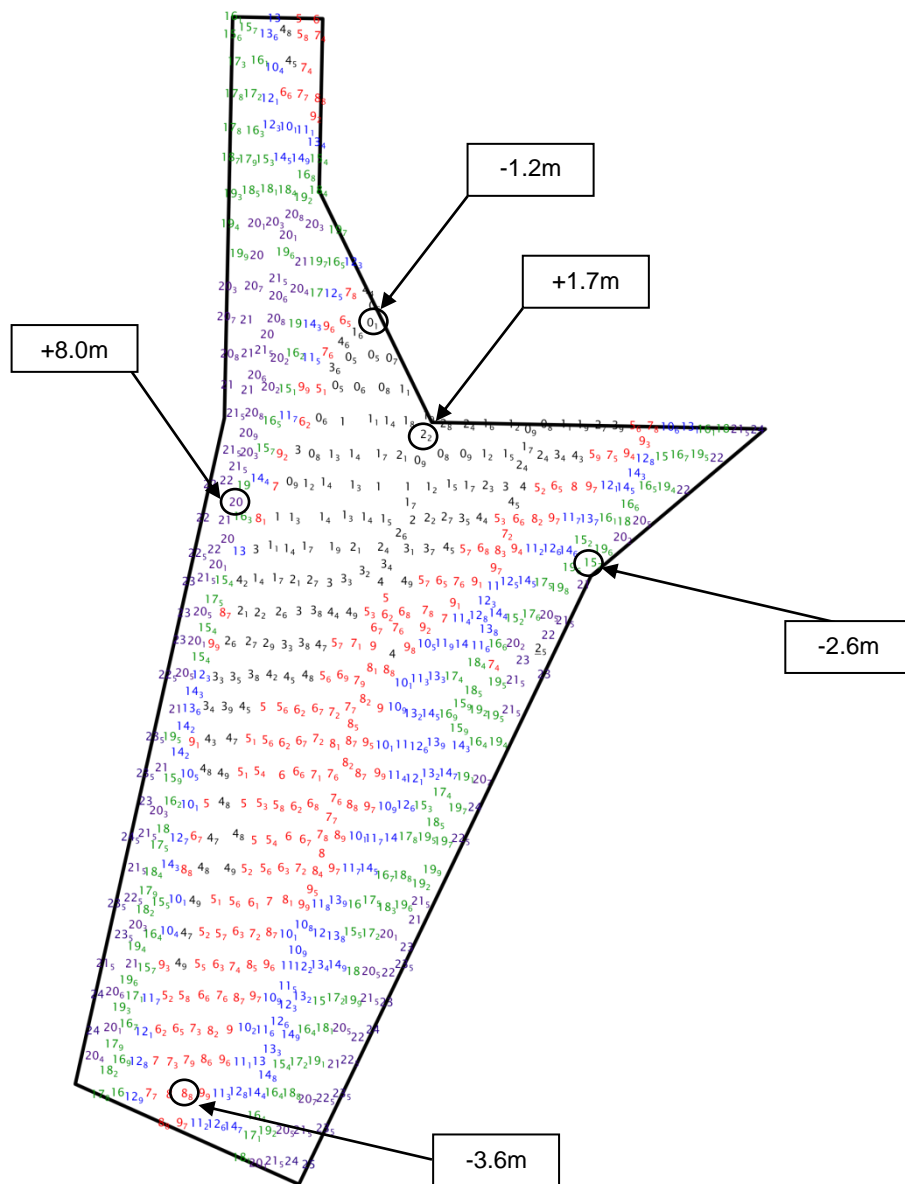
2009 SURVEY



○ Selected depth comparisons

Depths in Metres	
	0.0 to 5.0
	5.0 to 10.0
	10.0 to 15.0
	15.0 to 20.0

COLOUR BANDED DEPTH PLOT FOR SOUTH CALLIPER  
FROM THE 2015 SURVEY SHOWING SELECTED DEPTHS



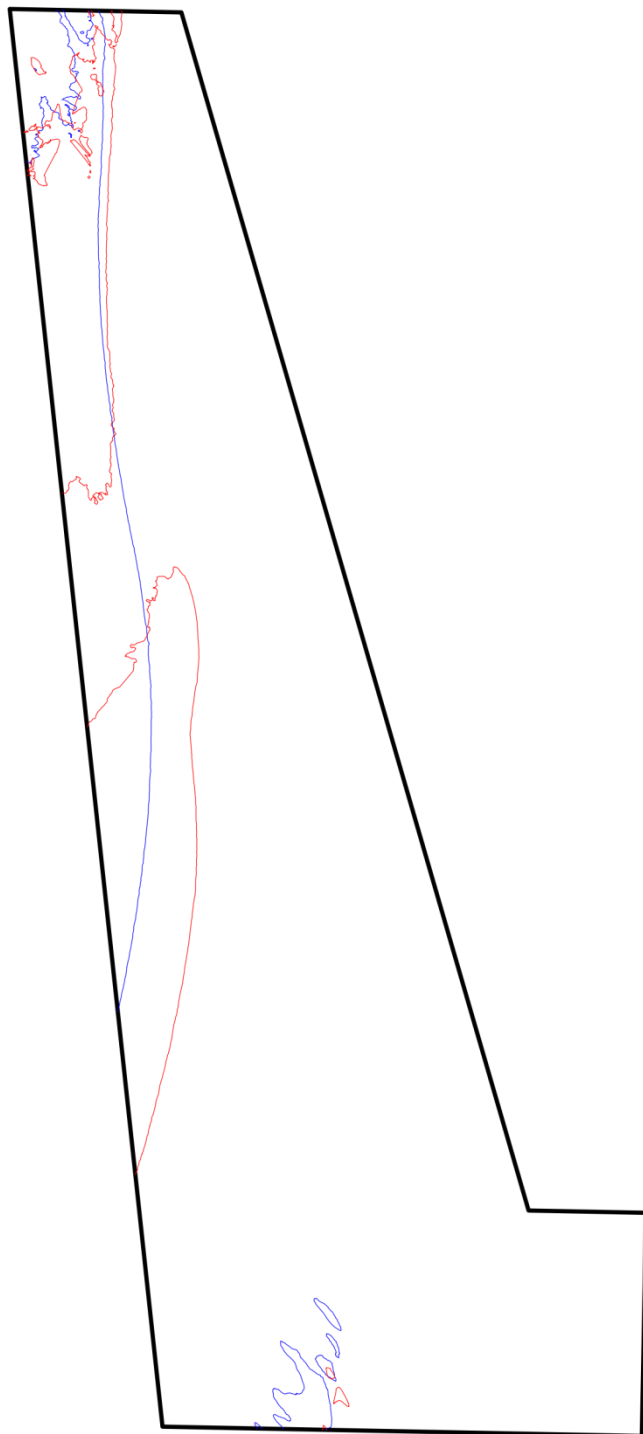
Deepening + Positive value / Shoaling - negative value



Depth changes indicated above are from the closest corresponding 2009/2012 sounding available. Hence depth differences will be from different positions from the 2015 sounding selection as an automatic shoal bias sounding selection tool has been utilised which produces a representation of the shoal values in a data set.

Depths in Metres	
	0.0 to 5.0
	5.0 to 10.0
	10.0 to 15.0
	15.0 to 20.0



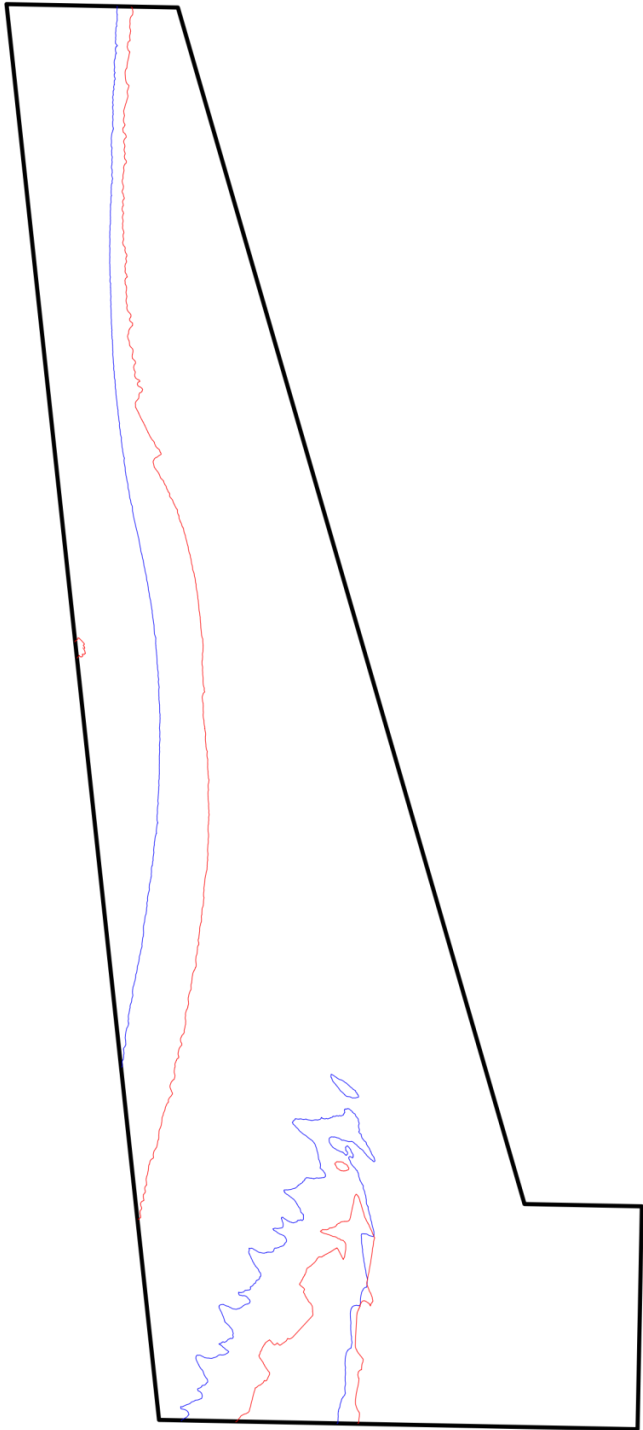
COMPOSITE DIAGRAM OF THE GOODWIN KNOLL  
5 METRE CONTOUR FROM THE 2009 AND 2015 SURVEYS  
SCALE 1:25,000





Year of Survey	
	2009
	2015



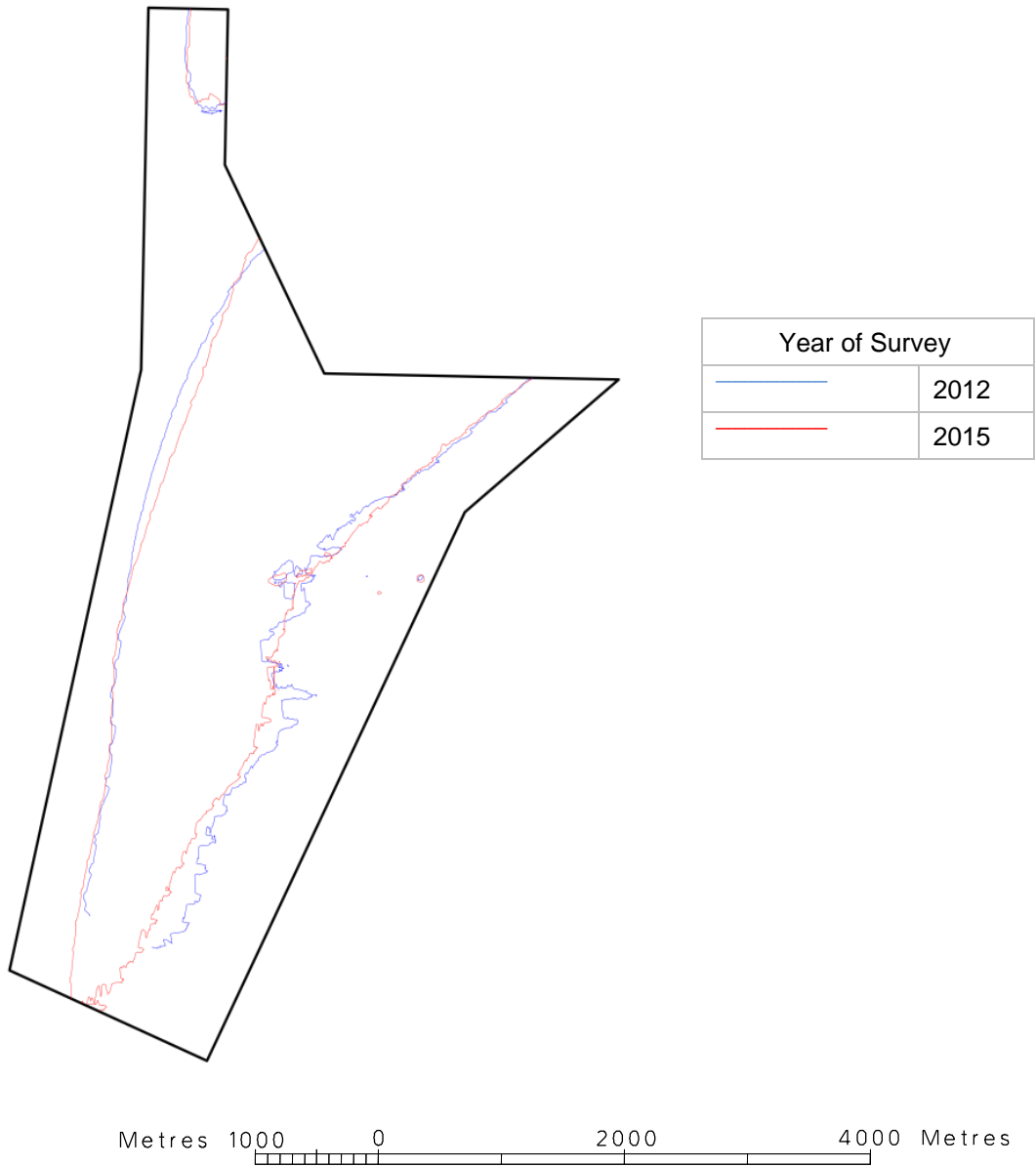
COMPOSITE DIAGRAM OF THE GOODWIN KNOLL  
10 METRE CONTOUR FROM THE 2009 AND 2015 SURVEYS  
SCALE 1:25,000



Year of Survey	
	2009
	2015



COMPOSITE DIAGRAM OF THE SOUTH CALLIPER  
 10 METRE CONTOUR FROM THE 2012 AND 2015 SURVEYS  
 SCALE 1:60,000



Southernmost section of South Calliper where no survey data was obtained in 2012 (south of dotted green line). Extract shows 10m contours for 2009 and 2015 surveys



## PROPOSED REVISED LIMITS

As a part of the separate GS1 South Sand Head and GS3 Northern Head of South Calliper Routine Resurvey assessments, additional minor revisions have been recommended to the GS4 area

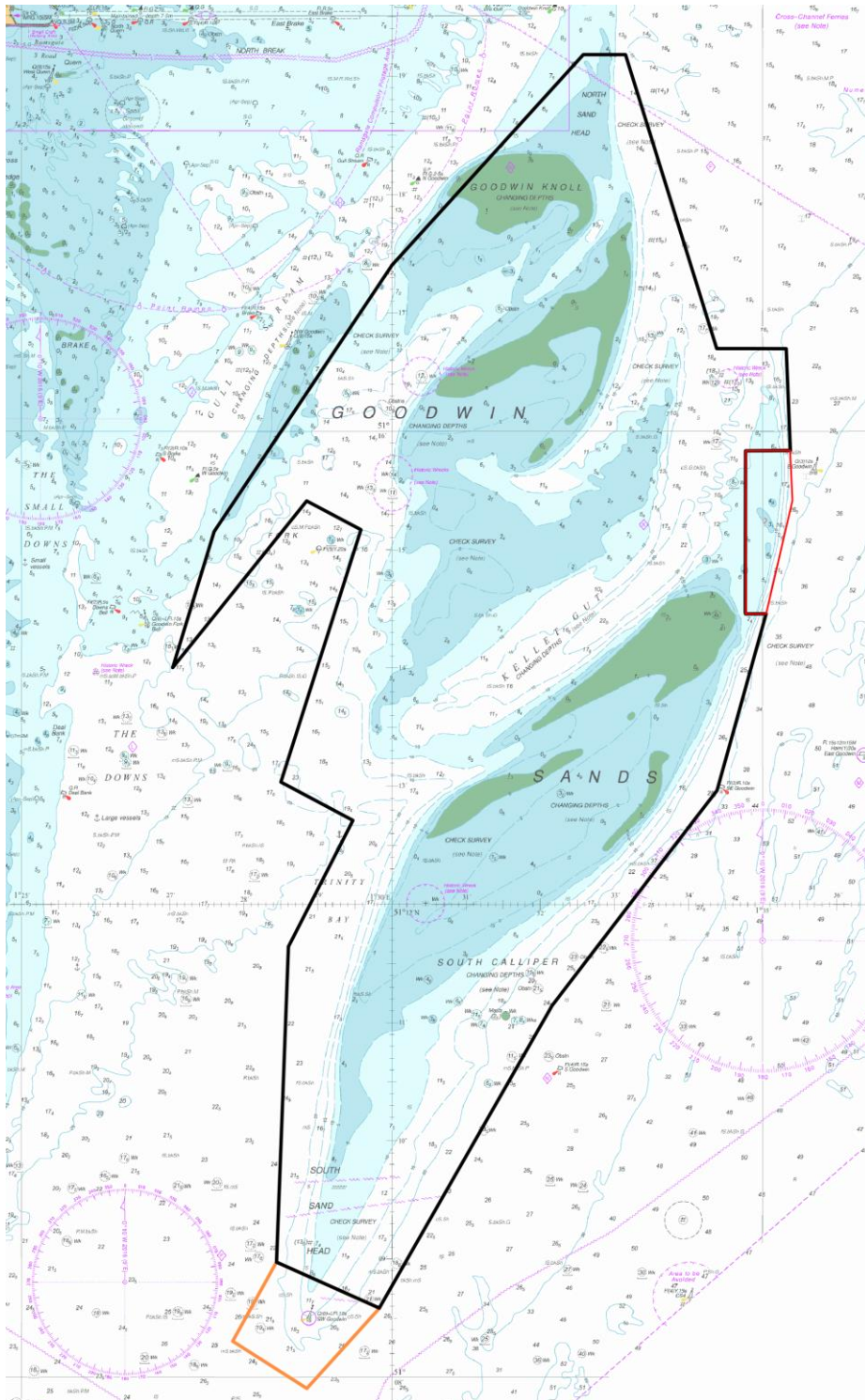
(See Assessment GS1/2015 and Assessment GS3/2015).

The coordinates below incorporate the area revisions from the GS1 and GS3 areas and the diagram on the following page illustrates the revised final survey areas for GS1, GS3 and GS4

The coordinates for the revised GS4 12 year resurvey area are:

	Latitude	Longitude
A	51°19.17'N	001° 33.15'E
B	51°16.69'N	001° 34.37'E
C	51°16.69'N	001° 35.32'E
D	51°15.83'N	001° 35.37'E
E	51°15.83'N	001° 34.77'E
F	51°14.45'N	001° 34.77'E
G	51°12.96'N	001° 34.77'E
H	51°11.14'N	001° 32.16'E
I	51°08.58'N	001° 29.83'E
J	51°08.97'N	001° 28.44'E
K	51°11.64'N	001° 28.60'E
L	51°12.71'N	001° 29.47'E
M	51°13.03'N	001° 28.50'E
N	51°15.16'N	001° 29.58'E
O	51°15.41'N	001° 28.84'E
P	51°14.00'N	001° 27.04'E
Q	51°15.15'N	001° 27.60'E
R	51°17.40'N	001° 30.00'E
S	51°19.17'N	001° 32.58'E
A	51°19.17'N	001° 33.15'E

Proposed Revised GS4 Area  
 Also Showing Revised GS1 and GS3 Survey Areas



—	Revised GS4 12 year survey area limits
—	Revised GS1 3 year resurvey area limits
—	Revised GS3 6 year resurvey area limits