

# Hydrographic Survey The Orkneys Eastern Approaches to Sanday and Stronsay

*HI 1137*

## Specification

*Navigation Safety Branch*

3 August 2005

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## Record of Changes

Version	Date	Amendment
Draft for Consultation	01 July 2005	
MCA Changes	28 July 2005	
V1.0	3 August 2005	

## Symbols & Abbreviated Terms

<b>DGPS</b>	Differential Global Positioning System
<b>GPS</b>	Global Positioning System
<b>HI</b>	Hydrographic Instruction
<b>HQAIs</b>	Hydrographic Quality Assurance Instructions
<b>IHO</b>	International Hydrographic Organization
<b>MCA</b>	Maritime & Coastguard Agency
<b>RoS</b>	Report of Survey
<b>RTK</b>	Real Time Kinematic
<b>UKHO</b>	United Kingdom Hydrographic Office
<b>WADGPS</b>	Wide Area DGPS (i.e. multiple reference station)

## Acknowledgements

1. Hydrographic Survey Specifications – Shipping Lane 2 (v1.2) 17/10/00 *Land Information New Zealand*
2. Hydrographic Instruction HI1043 Scotland, West Coast, Crossapol Bay 19/11/02 *United Kingdom Hydrographic Office*

3. Technical Specifications for HI1059 Western Approaches to English Channel  
20/08/03 United Kingdom Hydrographic Office

# **HYDROGRAPHIC SURVEY SPECIFICATION - THE ORKNEYS- EASTERN APPROACHES TO SANDAY AND STRONSAY HI 1137**

## **1 Scope**

This document details the project-specific requirements for conducting the “The Orkneys – Eastern Approaches to Sanday and Stronsay” hydrographic survey (Hydrographic Instruction Number 1137).

## **2 Related Standards**

The most recent versions of the following publications are to be adhered to in conjunction with this specification:

Hydrographic Quality Assurance Instructions for Admiralty Surveys (HQAs)  
NP145. *United Kingdom Hydrographic Office*

Standards for Hydrographic Surveys. Special Publication No. 44. April 1998.  
*International Hydrographic Organisation*

### 3 Project Specifications

No.	Activity	Required Y/N	Note
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	Project Nomenclature		
1.1	Labelling of records & deliverables	Y	<p>Project Name: The Orkneys – Eastern Approaches to Sanday and Stronsay</p> <p>Hydrographic Instruction Number 1137</p> <p>Contract Number: (To be Advised)</p> <p>Each rendered item of hard-copy and digital data shall be signed by the Charge Surveyor and is to bear a depiction of the MCA logo, together with the project name and the HI number.</p>

	Personnel		
2.1	Charge Surveyor	Y	<p>A Charge Surveyor (Party Chief/Surveyor in Charge) shall be on site at all times during survey operations. The Charge Surveyor shall be an IHO/FIG Category A qualified surveyor with a minimum of 5 years offshore surveying experience including surveying for Nautical Charting purposes. The Charge Surveyor shall have the authority and experience to make and implement operational decisions and will be available for the UKHO/MCA to contact regularly to assess progress and modify the survey plan if necessary. The Charge Surveyor's other duties and responsibilities shall be arranged such that they do not interfere with the management of the contract.</p>

	Sounding		
3.1	Sounding of Survey area including Check-lines and Cross-lines	Y	Cross lines are to be run at right angles to the main lines at intervals of approximately 20 times the mean main line spacing in order to conduct crossline comparisons.
3.2	Depth Accuracy	Y	Depth accuracy shall be in accordance with IHO

			Order 1. The contractor shall demonstrate (by the inclusion of a fully developed error budget in the RoS), that this requirement has been met.
3.3	Target Detection	Y	<p>For all parts of the survey area, the minimum size of object detected shall be:</p> <p>Cube with sides of 2m in depths &lt; 40m</p> <p>Cube with sides of 10% of depth in depths &gt;40m</p> <p>Each object (see above) is to be detected by at least 3 valid multibeam 'pings' in the along-track direction and 3 valid 'pings' in the across-track direction..</p> <p>Object detection shall also be demonstrated empirically.</p>
3.4	Reduction of Soundings	Y	<p>Soundings shall be reduced for tides in all depths. Soundings are to be presented as depths below Chart Datum.</p> <p>The contractor shall demonstrate that the method chosen for tidal reduction results in the overall depth accuracy requirements being met (see 3.2).</p>
3.5	Survey line spacing	Y	Line spacing shall be such that requirements 3.2 and 3.3 are met in full and shall take account of any degradation in the outer beams of the MBES.
3.6	Examinations and elimination of doubtful data	Y	All significant shoals together with suspected wrecks located during the course of the survey shall be reported (wrt position, extent and least depth). However, investigations in excess of the standard survey lines are not required. A definitive list of any newly discovered shoals, together with charting recommendations, shall be presented in the Report of Survey.
3.7	Monthly Report	Y	The contractor shall provide details of the maximum sea state and weather conditions in which the survey system can meet the stated specifications and standards of the survey. A monthly status report shall be delivered to MCA (Rob Spillard) and UKHO (Ian Davies) stating any weather or equipment down-time, a summary of the monthly operations and a chartlet depicting the area of the HI completed.
3.9	Presentation of depth data	Y	Depth data recorded shall be logged to two decimal places of a metre.

	Tides		
4.1	Establishment of Tidal stations and Establishment of Vertical Control	Y	At least two primary tidal stations shall be established within the extents of the entire survey area. Tidal observations shall cover the duration of the survey and shall cover a period of at least thirty days. Each tide station shall be levelled to at least two permanently monumented and documented benchmarks and referred to Ordnance Datum Kirkwall. Levelling shall be conducted in accordance with HQAIs. Spheroidal heights of any existing or newly established benchmarks shall be determined by GPS carrier-phase techniques tied in to the Ordnance Survey Active Network (see section 5).
4.2	Pole-to-gauge calibration	Y	Automatic tide gauges shall be calibrated at installation against a tidepole in accordance with HQAIs. Gauges shall be checked against pole readings at regular intervals and a confirmation calibration shall also be carried out prior to the gauge being recovered.
4.3	Reduction of soundings	Y	Tidal reduction methodology shall be as per the accepted NetSurvey tender. It is the contractors responsibility to ensure that tidal data is of suitable quality to attain IHO Order 1 survey requirements.
4.4	Record tidal time, height and data. Conduct Datum Transfer	Y	See 4.1.  All soundings shall be reduced to Chart Datum (Chart BA 2250), See Table II of Admiralty tide Tables for present Chart Datum / Ordnance Datum connection.
4.5	Confirmation of Chart Datum	Y	The connection between benchmarks utilised to establish the current Chart Datum and Ordnance Datum Kirkwall is to be confirmed by physical observation. The contractor shall make a clear statement if any change to the currently listed Chart Datum statement is required – or whether it is still valid
4.6	Recording and analysing Tidal Stream information	N	Not required for this survey
4.7	Eddies and Over-falls	Y	Subjective observations shall be provided in the Report of Survey.



	Positioning & Control		
5.1	Extension of existing control	Y	Any extension of existing geodetic control and the establishment of new stations shall be fully documented. The derivation of the co-ordinates of existing stations shall be stated. Adjustment of all observations shall be by the method of Least Squares.
5.2	Establishment of geodetic stations	Y	All geodetic stations shall be fixed using dual frequency carrier phase GNSS techniques. The Contractor must state how they propose to co-ordinate stations. Where necessary, co-ordinate conversion shall be conducted using the Ordnance Survey (OS) OSTN02 conversion program and an estimated final accuracy stated.
5.3	Station marking and documentation	Y	All geodetic stations established during the survey shall be described, photographed and permanently marked to assist their future recovery in accordance with HQAIs.
5.4	Primary offshore Positioning System	Y	Fugro StarFix HP via MultiFix 4 (Government furnished equipment)
5.5	Secondary offshore positioning system	Y	CSI Wireless DGPSMax (Government furnished equipment)
5.6	Order of Survey Horizontal Accuracy	Y	IHO Order 1
5.7	Static Positioning Check	Y	Perform at the start of survey
5.8	Dynamic Navigational Calibration	Y	Perform at the start of the survey
5.9	Primary / Secondary Comparisons	Y	A comparison showing differences between primary and secondary positioning systems shall be performed at the start and end of the survey.

	Coastline / Topography		
6.1	Obtaining Coastline Data	Y	Coastline and topography shall be obtained from the latest 1:10,000 Ordnance Survey data

	Miscellaneous Requirements		
7.1	Side-scan sonar	N	Not required
7.2	Magnetometer	N	Not required
7.3	Wire-Sweep	N	Not required
7.4	Bottom Sampling	N	Not required – but may be gathered in future seasons
7.5	Sound Velocity	Y	The contractor shall observe sound velocity profiles at an interval consistent with the proposed error budget. Observations from the hull-mounted velocimeter (government furnished) shall be applied real-time to the multibeam sounder.
7.6	Secchi Disk	N	Not required – but may be gathered in future seasons
7.7	Amendments to sailing directions		The North Coast of Scotland Pilot (NP52) shall be checked in the field and appropriate amendments rendered. Particular attention shall be paid to any recommended approach routes and anchorages within or adjacent to the survey area.
7.8	Views for sailing directions	Y	Existing views in The North Coast of Scotland Pilot (NP 52) shall be consulted and photographic views obtained if considered useful. New photography shall be in colour and prepared in accordance with NP100. Digital cameras shall have a least 3M pixel resolution.
7.9	Permissions	Y	The contractor shall be responsible for arranging all permits, permissions and licenses for flight, access and frequency clearance for all survey operations whether ashore, afloat or in the air.
7.10	Fixed and floating aids to navigation	Y	The positions of all fixed and floating aids to navigation are to be determined, where the objects are observed, and the positions presented in tabular format.
7.11	Light characteristics	Y	Light characteristics and sectors shall be rendered in accordance with HQAIs.

	Safety		

8.1	Responsibility	Y	Vessels, equipment and survey personnel provided by the Contractor for work in connection with the contract shall be the Contractor's responsibility at all times. The said vessels, equipment and survey personnel and any loss, injury or damage suffered or caused by them shall be at the Contractor's risk throughout.
8.2	Safety Management Plan	Y	All survey personnel provided by the contractor shall adhere to both NetSurvey's and Klyne Tug's recommended safety procedures at all times.

## 4 Project Deliverables

No.	Deliverable	Required Y/N	Note
9.1	Required deliverables	Y	The following records shall be rendered in accordance with HQAIs and these instructions: <ol style="list-style-type: none"> <li>a. Navaid Calibration/validation data</li> <li>b. Processed sounding data (HIPS/SIPS Project directory or GSF)</li> <li>c. Raw sounding data (proprietary Reson 7K format)</li> <li>d. Digital Report of Survey (UKHO format)</li> <li>e. Co-tidal factors (if used)</li> <li>f. Geodetic data</li> <li>g. Wreck records</li> <li>h. Tidal records</li> <li>i. Amendments to Lights' List</li> <li>j. Photographic Views</li> <li>k. Miscellaneous observations records</li> <li>l. Backscatter mosaic in high resolution GeoTIFF format</li> </ol>
9.2	Hydrographic Note	Y	Reports of dangers to navigation shall be passed immediately to the UK Hydrographic Office, in accordance with HQAIs.
9.3	Authoritative Standard Sheets	N	Not required
9.4	"H Forms"	Y	"H Forms" have been designed by the UKHO to facilitate checking and validation of rendered data. The contractor shall always use the appropriate "H Form" where one exists for a process which is undertaken.
9.5	Digital Data Media	Y	All Data shall be delivered on USB2 or firewire removable Hard Drives.
9.6	Report of Survey (RoS)	Y	A Report of Survey (RoS) shall be rendered in digital format in accordance with the latest UKHO requirements for digital RoS.
9.7	Format of Bathymetric Data	Y	Processed bathymetric data shall be rendered as files in HIPS/SIPS or GSF format. Corresponding raw (i.e. unprocessed) files shall also be supplied in proprietary format. Files shall be full density (i.e. not "thinned") with rejected soundings flagged but not

			deleted from the data set.
9.8	Comparison with published charts	Y	The detail shown on each published UKHO chart of the survey area is to be critically examined and any significant errors, ambiguities or other defects shall be reported on an annotated copy.
9.9	Presentation of data		A complete set of field records shall be delivered to the UK Hydrographic Office when all points raised in the appraisal have been clarified. They shall be packaged and labelled using standard forms as supplied by the UK Hydrographic Office. Standard UK Hydrographic Office forms are available through the MCA.
9.10	Retention of data		All raw and processed digital records shall be retained and maintained by the Contractor for a period of 2 years from the date of the final contract payment. On completion of this two year period, the Contractor may seek permission from UKHO/MCA to dispose of the data as they so wish.
9.11	Crown copyright		All data and accompanying documents and records, both working and fair, originating from the survey become the property of HM Government and must be handed over on demand. Where appropriate, they are to carry the following official markings:  CROWN COPYRIGHT 2005  FOR OFFICIAL USE ONLY

## 5 Survey Geodesy

The survey shall be rendered using the following geodetic parameters

Datum: ITRF 2000  
 Spheroid: GRS '80  
 Projection: UTM Grid Zone 30 North (Central Meridian 3° West).

All rendered positions shall be quoted as geographical co-ordinates (i.e. in terms of Lat. / Long) as degrees and decimal minutes.

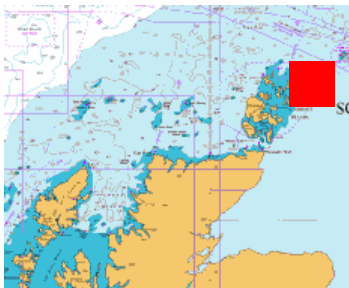
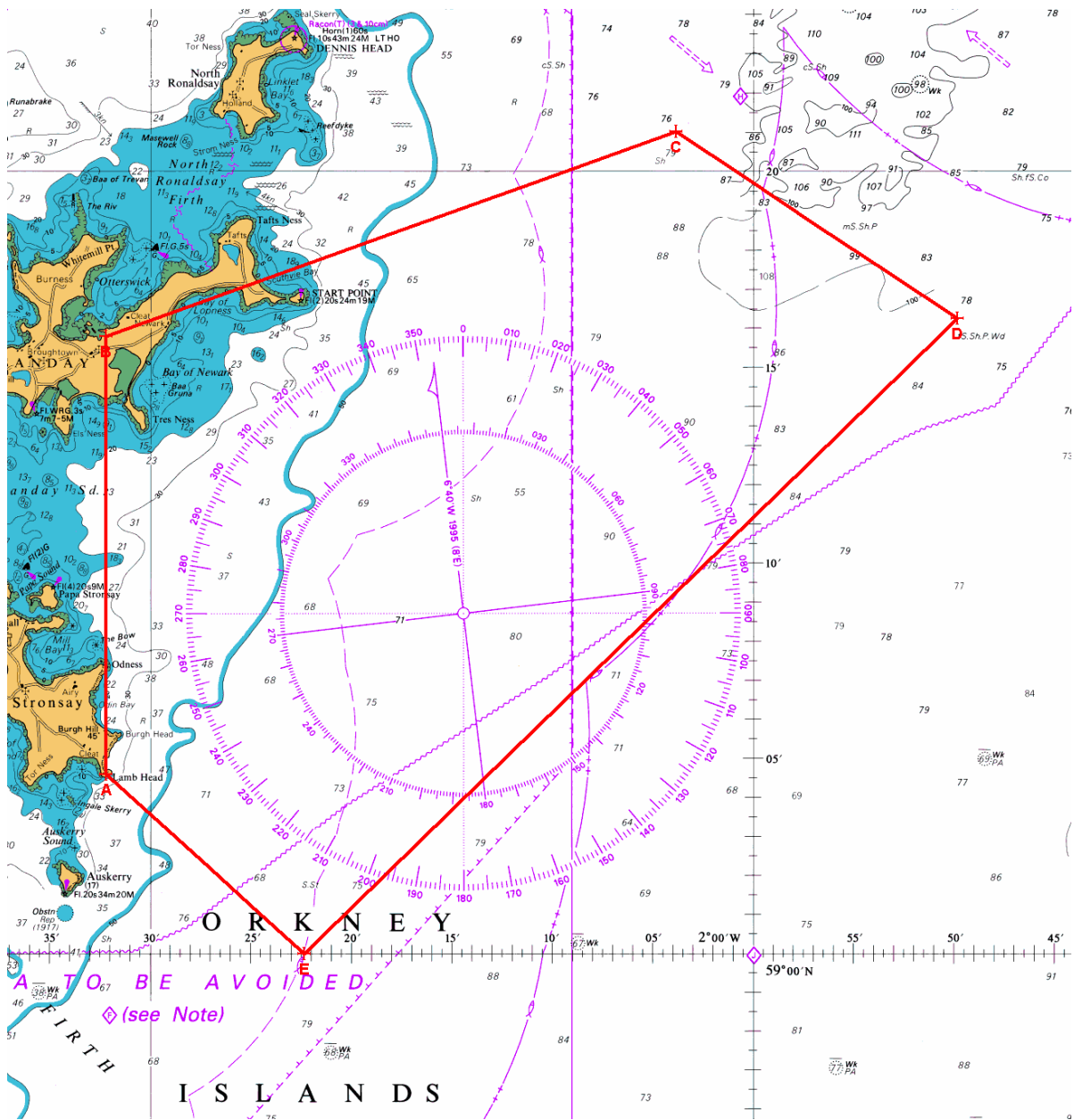
## Annex 1 –Survey Area

The contractor shall quote for each of the following survey areas to be surveyed. All coordinates are quoted as WGS 84.

### Area A

<b>Point</b>	<b>Latitude DD MM.MM</b>	<b>Longitude DDD MM.MM</b>
A	59 04.60 N	002 32.35 W
B	59 15.80 N	002 32.35 W
C	59 21.00 N	002 04.00 W
D	59 16.25 N	001 50.50 W
E	59 00.00 N	002 22.50 W

Total area = 900 km<sup>2</sup> approx



Regional Overview

Reproduced from Admiralty chart BA2250 with the permission of Her Majesty's Stationery Office and the UK Hydrographic Office.

## Annex 2 – Government Furnished Data

The following government furnished data accompanies this specification:

1. Hydrographic Quality Assurance Instructions for Admiralty Surveys (HQAI) (Edition 02/04)
2. Electronic copy of current UK Hydrographic Office “H-Forms”
3. Format example of UKHO “Electronic Report of Survey”
4. Details of all known wrecks
5. GeoTIFF copies of charts BA2250 and BA2562 and BA2622
6. 1:10,000 GeoTIFF copies of OS maps of the area.

Note: Government furnished data remains the property of the Maritime and Coastguard Agency. As such, the data must be returned to the Maritime and Coastguard Agency once the contract has been completed. All government furnished data is Crown Copyright and must not be duplicated or distributed without the permission of the MCA. Government Furnished Data must not be used for navigation.

## Annex 3 – Tide Station Data

Soundings are to be reduced using observations at Kettletoft, adjusted as necessary by the use of co-tidal corrections taken from Co-Tidal Chart 5058 (1996 Edition) or from the analyses of seabed tidegauge observations.

Chart Datum at Kettletoft is 1.90m below Ordnance Datum (Kirkwall) or 2.2m below Mean Sea Level, but with no benchmarks held on the UKHO tidal database a transfer of Datum from Kirkwall using Form H533 may be necessary.

Chart Datum at Kirkwall is 1.66m below Ordnance Datum (Kirkwall) ; or 6.25m below Ordnance BM (4.59m) cut on inner side of top of E parapet of Ousemouth Bridge ; or 5.09m below Ordnance BM (3.43m) cut on SW face 5m from S angle of Harbour Master's Office.

## Annex 4 – Wreck Data

### WRECKS HMOI 1137 – E Approaches to Sanday and Stronsay

#### Area of coverage :

59 04'.600 N 002 32'.350 W  
 59 15'.800 N 002 32'.350 W  
 59 21'.000 N 002 04'.000 W  
 59 16'.250 N 001 50'.500 W  
 59 00'.000 N 002 22'.500 W

#### Selection Parameters :

LIVE wrecks : YES                      Fouls : YES  
 ABEY wrecks : YES                     Fishermens Fasteners : YES  
 LIFT wrecks : YES                     Classified wrecks : YES  
 DEAD wrecks : YES                    Non-Sub Contacts : YES

#### Categories :

% FULL INVESTIGATION OR DISPROVE POSITION  
 / FOR INFORMATION. NO SPECIAL SEARCH NOW REQUIRED  
 = FURTHER INVESTIGATION REQUIRED  
 @ NO FURTHER INVESTIGATION REQUIRED  
 \* TO BE WIRE SWEEPED

Cat.	No.	Latitude	Longitude	Horiz Datum	WGS84 Latitude	WGS84 Longitude	Symbol
=	487	59 17'.000 N	002 23'.000 W	OGB	59 16'.973 N	002 23'.102 W	
=	486	59 16'.800 N	002 22'.000 W	OGB	59 16'.773 N	002 22'.102 W	ST
=	485	59 16'.767 N	002 26'.833 W	OGB	59 16'.740 N	002 26'.935 W	ST
=	484	59 16'.000 N	002 22'.500 W	OGB	59 15'.973 N	002 22'.602 W	
%	483	59 15'.000 N	002 18'.000 W	OGB	59 14'.973 N	002 18'.103 W	
=	59245	59 05'.600 N	002 31'.440 W	OGB*	59 05'.574 N	002 31'.540 W	
%	480	59 03'.250 N	002 23'.000 W	OGB	59 03'.225 N	002 23'.101 W	
%	471	59 01'.000 N	002 24'.200 W	OGB	59 00'.975 N	002 24'.301 W	

**Total Wrecks** : 8      Live : 8      Abey : 0      Lift : 0      Dead : 0      Charted : 2  
 Uncharted : 6      Classified : 0