

Hydrographic Survey – Sanday Sound to Westray Firth (Orkney Islands)

HI 1122

Specification v1.0

Navigation Safety Branch

10 December 2004

Contents

1	Scope	5
2	Related Standards.....	5
3	Project Specifications.....	6
4	Project Deliverables	13
5	Survey Geodesy	15
	Annex 1 –Survey Area.....	16
	Area A	16
	Area B	16
	Area C	17
	Annex 2 – Government Furnished Data	19
	Annex 3 – Wreck Data.....	20
	Annex 4 – Tide Station Data.....	21
	Loth	21
	Kettletoft	21
	Annex 5 – Payment Schedule	22
	Annex 6 – Price.....	23
	Annex 7 – Tender Evaluation Criteria	24

Record of Changes

Version	Date	Amendment
Draft for Consultation	06 December 2004	
Version 1.0	10 December 2004	Various changes

Symbols & Abbreviated Terms

DGPS	Differential Global Positioning System
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
HI	Hydrographic Instruction
HQAIs	Hydrographic Quality Assurance Instructions
IHO	International Hydrographic Organization
MCA	Maritime & Coastguard Agency
RoS	Report of Survey
RTK	Real Time Kinematic
UKHO	United Kingdom Hydrographic Office
WADGPS	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 - SANDAY SOUND TO WESTRAY FIRTH (ORKNEY ISLANDS) HI 1122

1 Scope

This document details the project-specific requirements for conducting the “Sanday Sound to Westray Firth (Orkney Islands)” hydrographic survey (Hydrographic Instruction Number 1122).

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
-----	----------	-----------------	------

Project Nomenclature			
1.1	Labelling of records & deliverables	Y	<p>Project Name: Sanday Sound to Westray Firth (Orkney Islands)</p> <p>Hydrographic Instruction Number 1122</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	<p>The entire survey area from the drying line to seaward shall be surveyed in accordance with this specification. 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.</p>

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. A fully developed error budget shall also be included in the tender.
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 < 40m</p> <p>Cube with sides of 10% of depth in depths >40m</p> <p>Where airborne lidar technology is used for target detection, the sounding spacing chosen shall ensure that each object (see above) is illuminated by at least one sounding.</p> <p>Where multibeam bathymetry is used for target detection, each object (see above) is to be detected by at least 3 valid 'pings' in the along-track direction and 3 valid 'pings' in the across-track direction.</p> <p>Where side-scan sonar is used for target detection, each object (see above) is to be detected by at least 5 'pings' in the along-track direction. In this case, in addition to the SSS insonification, each object need only be insonified by MBES or lidar with 1 sounding as well.</p> <p>Irrespective of the methodology chosen by the contractor, 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 requirement 3.3 is met in full. Where airborne lidar technology is utilised, any overlapping swaths are to be flown at significantly different states of the tide so as to minimise the effects of surf.
3.6	Examinations and elimination of doubtful	Y	All significant shoals together with suspected wrecks located during the course of the survey shall be reported (with respect to position, orientation, extent

	data		and least depth). All such suspected wrecks are to be further investigated by running one survey line, centred over the centre of the wreck and orientated along the long axis and sufficient other lines run at right angles to the first so as to cover the entire length. A definitive list of any newly discovered shoals, together with charting recommendations, shall be presented in the Report of Survey.
3.7	Environmental Limitations	Y	As a tender deliverable, 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
3.9	Presentation of depth data	Y	Depth data recorded shall be logged to two decimal places of a metre.

	Tides & Vertical Control		
4.1	Establishment of Tidal stations and Vertical Control	Y	<p>At least two primary tidal stations shall be established within the extents of the entire survey area – one being at Loth and the other being at Kettletoft. 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 Ordnance Survey benchmarks and referred to Ordnance Datum. Levelling shall be conducted in accordance with HQAIs.</p> <p>Spheroidal heights of any existing or newly established benchmarks shall be determined by dual frequency carrier phase GNSS techniques, tied in to the Ordnance Survey Active Network (see section 5).</p>
4.2	Pole-to-gauge calibration	Y	Automatic tide gauges shall be calibrated against a tidepole in accordance with HQAIs. The exact method of this calibration – including the recording interval and calibration duration shall be included as a tender deliverable.
4.3	Reduction of soundings	Y	The contractor shall provide recommendations for observing tides and sounding reduction to MCA for approval as a tender deliverable. Recommendations shall utilise tidal models based on actual tidal observations (see 4.1). It is the contractor's responsibility to ensure that tidal data is of suitable

			quality to attain IHO Order 1 survey requirements.
4.4	Chart Datum	Y	See 4.1. All soundings shall be reduced to Chart Datum (Chart BA 2250), See Table III of Admiralty Tide Tables for present Chart Datum / Ordnance Datum connection.
4.5	Transfer of Datum	Y	The contractor shall establish a tide gauge at Kirkwall, levelled in to Ordnance datum, and shall perform a Transfer of Datum for a minimum of a 39 hour period between this gauge and the Loth gauge in accordance with Admiralty Tidal Handbook No2.
4.6	Recording and analysing Tidal Stream information	N	Not required for this survey
4.7	Eddies and Over-falls	N	Not required for this survey

	Positioning & Horizontal 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	WADGPS or RTK GPS.
5.5	Secondary offshore positioning system	Y	Entirely independent WADGPS, RTK GPS or Post-processed carrier phase GPS

5.6	Order of Survey Horizontal Accuracy	Y	IHO Order 1
5.7	Static Positioning Check	Y	Perform at the start of survey (methodology shall be detailed in tender)
5.8	Dynamic Navigational Calibration	Y	Perform at the start of the survey (methodology shall be detailed in tender)
5.9	Primary / Secondary Comparisons	Y	The contractor shall provide a summary for each survey line showing differences between primary and secondary positioning systems.
5.10	Quality	Y	The positioning system is to log and provide a continuous indication of the quality of the position and is to be monitored throughout the survey.

	Coastline / Topography		
6.1	Obtaining Coastline Data	Y	Coastline and topography shall be obtained in accordance with IHO S44 Order 1. As a minimum, the latest Ordnance Survey 1:10,000 scale mapping shall be obtained and any navigationally significant differences between this and observed survey data are to be reported.

	Miscellaneous Requirements		
7.1	Side-scan sonar	Y/N	The onus is on the contractor as to which technology he chooses to fulfil IHO target detection requirements.
7.2	Magnetometer	N	Not required
7.3	Wire-Sweep	N	Not required
7.4	Bottom Sampling	N	Not required
7.5	Sound Velocity	Y/N	If acoustic methods are employed for determining bathymetry, the contractor shall observe sound velocity at an interval consistent with the proposed error budget.
7.6	Secchi Disk	N	Not required

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. If visible in the data, the positions of sinkers for floating aids to navigation can be used as the position for the aid. Soundings taken on the subsurface portion of a fixed aid can be used as the position for the aid. 'Soundings' obtained on top of fixed aids can be used for the position. If LIDAR technology is utilised, "Soundings" taken on surface aids to navigation are to be removed from the main bathymetry data set.
7.11	Light characteristics	Y	Light characteristics and sectors shall be rendered in accordance with HQAIs.
7.12	Vessels	Y/N	Each vessel employed in the survey work shall be subject to approval by the MCA. Directly prior to the contract being placed, the Contractor shall inform the nearest MCA Office so that a MCA surveyor can carry out an inspection of the vessel(s). The purpose of the inspection shall be to ensure that each vessel is properly manned and equipped under the Merchant Shipping Acts.
7.13	Fishing Industry	Y	Liaison with, and compensation to, fishermen for loss/damage to fishing gear are matters which rest entirely with the Contractor. The Contractor is to liaise closely with local fisheries groups and the appropriate local District Fisheries Inspectors well in advance of the commencement of fieldwork.

7.14	Equipment Approval	Y	Tenders shall include the technical specifications of survey equipment to be used, although MCA reserves the right of approval. Equipment shall not be substituted without prior approval by MCA.
------	--------------------	---	---

	Safety		
8.1	Responsibility	Y	Vessels, aircraft, equipment, survey personnel and crews provided by the Contractor for work in connection with the contract shall be the Contractor's responsibility at all times. The said vessels, aircraft, equipment, survey personnel and crews 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	Details of the company safety policy and Safety Management Plan shall be supplied as part of the tender.

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"> a. Navaid Calibration/validation data b. Processed sounding data (HIPS/SIPS, Simrad PROC directory or GSF format) c. Raw sounding data (proprietary format) d. Digital Report of Survey (UKHO format) e. Co-tidal factors (if used) f. Geodetic data g. Wreck records h. Tidal records i. Amendments to Lights' List j. Photographic Views k. Miscellaneous observations records l. Backscatter or side-scan mosaic in high resolution GeoTIFF format (if MBES or SSS is utilised)
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 CD, DVD or USB 2 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, Simrad PROC directory or GSF format and shall contain the following attributes for each sounding as a minimum: position and depth; swath and beam number; backscatter intensity (if MBES); 95% statistical error estimation for position; 95% statistical error estimate for

			depth. 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. If lidar technology is utilised, files are to contain lidar wave forms.
9.8	Comparison with published charts	Y	The sounding detail shown on the largest scale published UKHO chart of the survey area is to be critically examined and any significant differences reported. In particular, a comment is required for any charted dangers that were not discovered during the survey, or where the least depth found over a danger during the survey is deeper than charted. Any other errors, ambiguities or other defects shall be reported on an annotated copy of the chart.
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 2004 FOR OFFICIAL USE ONLY

5 Survey Geodesy

The survey shall be rendered using the following geodetic parameters

Datum: ETRF'89
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 co-ordinates are quoted as WGS'84.

Area A

Point	Latitude DD MM.MM	Longitude DDD MM.MM
1	59 15.80 N	002 33.32 W
2	59 15.80 N	002 42.00 W
8	59 06.50 N	002 42.00 W
9	59 06.50 N	002 33.32 W

Total area = 142 km² approx

Area B

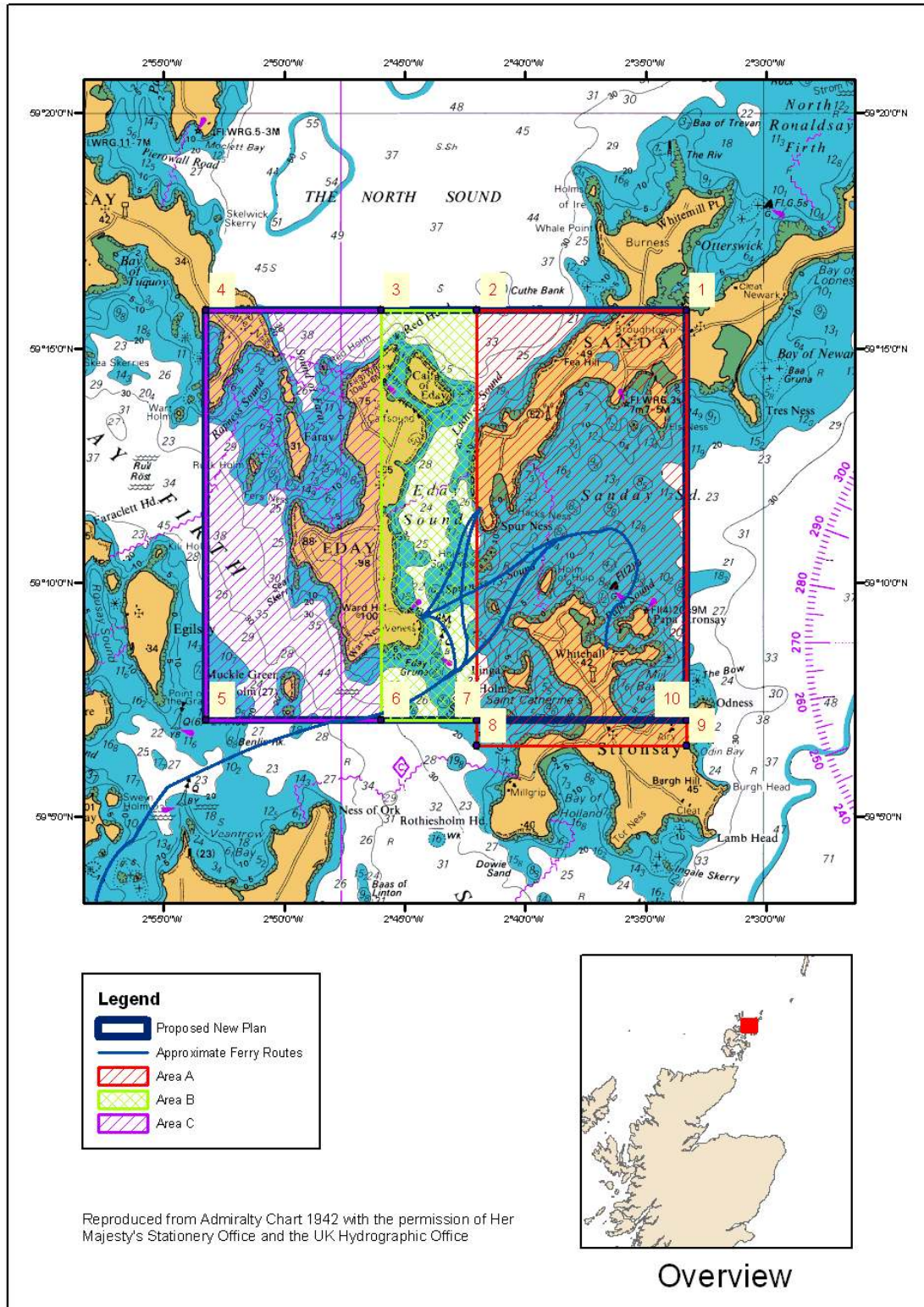
Point	Latitude DD MM.MM	Longitude DDD MM.MM
2	59 15.80 N	002 42.00 W
3	59 15.80 N	002 46.00 W
6	59 07.05 N	002 46.00 W
7	59 07.05 N	002 42.00 W

Total area = 62 km² approx

Area C

Point	Latitude	Longitude
3	59 15.80 N	002 46.00 W
4	59 15.80 N	002 53.25 W
5	59 07.05 N	002 53.25 W
6	59 07.05 N	002 46.00 W

Total area = 112 km² approx



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

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 awarded (for unsuccessful tenderers) or completed (for successful tenderers). 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 – Wreck Data

Wreck data has been removed from this specification for copyright reasons.

Annex 4 – Tide Station Data

Loth

No benchmark data is held at the UK Hydrographic Office for Loth. No connection to Kirkwall is currently available. Chart datum is currently stated as 2.23m below Mean Sea Level.

Kettletoft

No benchmark data is held at the UK Hydrographic Office for Kettletoft. Chart datum is currently stated as 1.90m below OD(Kirkwall) and also 2.2m below Mean Sea Level

Annex 5 – Payment Schedule

The contractor shall only undertake survey operations in the identified areas on approval of the MCA project manager and if they consider that environmental conditions are suitable for producing acceptable survey data.

All data gathering operations must be completed before 1st April 2005.

All deliverables shall be rendered before 1st August 2005.

The following are the stages at which invoices may be submitted to MCA for payment subject to the written agreement of MCA's Project Manager:

1. 10% of the total contracted sum on mobilisation of fully equipped and functional vessel / aircraft to the survey area.
2. 50% of the total contracted sum on gathering survey data over 75% of the survey area, and approval of preliminary survey data (excluding tidal observations). If the contractor is unable to achieve valid soundings over the entire survey area (due to environmental constraints such as turbidity or bad weather), then the contractor must show that all reasonable endeavours (including time on site as stated in tenderer's project plan) have been exercised. If Lidar is being used, and poor turbidity is stated as the cause then the tenderer shall demonstrate the poor turbidity either by supplying the results of test flights flown across the area or rendering of secchi depths taken at sufficient locations to illustrate the problem. If poor weather is the stated reason then the tenderer shall demonstrate this by rendering supporting meteorological information such as weather reports from local harbours / airfields etc.
3. 10% of the total contracted sum on gathering survey data over the remaining 25% of the survey area and approval of preliminary survey data (excluding tidal observations).
4. 10% of the total contracted sum on approval of the rendered tidal and levelling observations.
5. 20% of the total contracted sum on approval of the final report of survey and digital data.

Note: each of the above milestones will not be paid if a preceding milestone has not been met. Each milestone will only be paid once.

Annex 7 – Tender Evaluation Criteria

The following broad headings will form the basis of the Tender Evaluation.

They are given in no particular order of priority

1. Track Record for SOLAS Charting Surveys
2. Quality Control Procedures
3. Quality Control Certificates
4. Evidence of Compliancy with IHO order 1.
5. Vessel / Aircraft suitability
6. Sounding equipment
7. Ancillary Equipment
8. Tidal Reduction Methodology
9. Primary/Secondary Positioning Details
10. Calibration Procedures
11. Survey Line Spacing
12. Details of proposed Data Flow
13. Environmental Criteria for cessation of surveying
14. Details/Experience of Key Personnel
15. Details of Sub-contractors
16. Safety Management Plan
17. Price