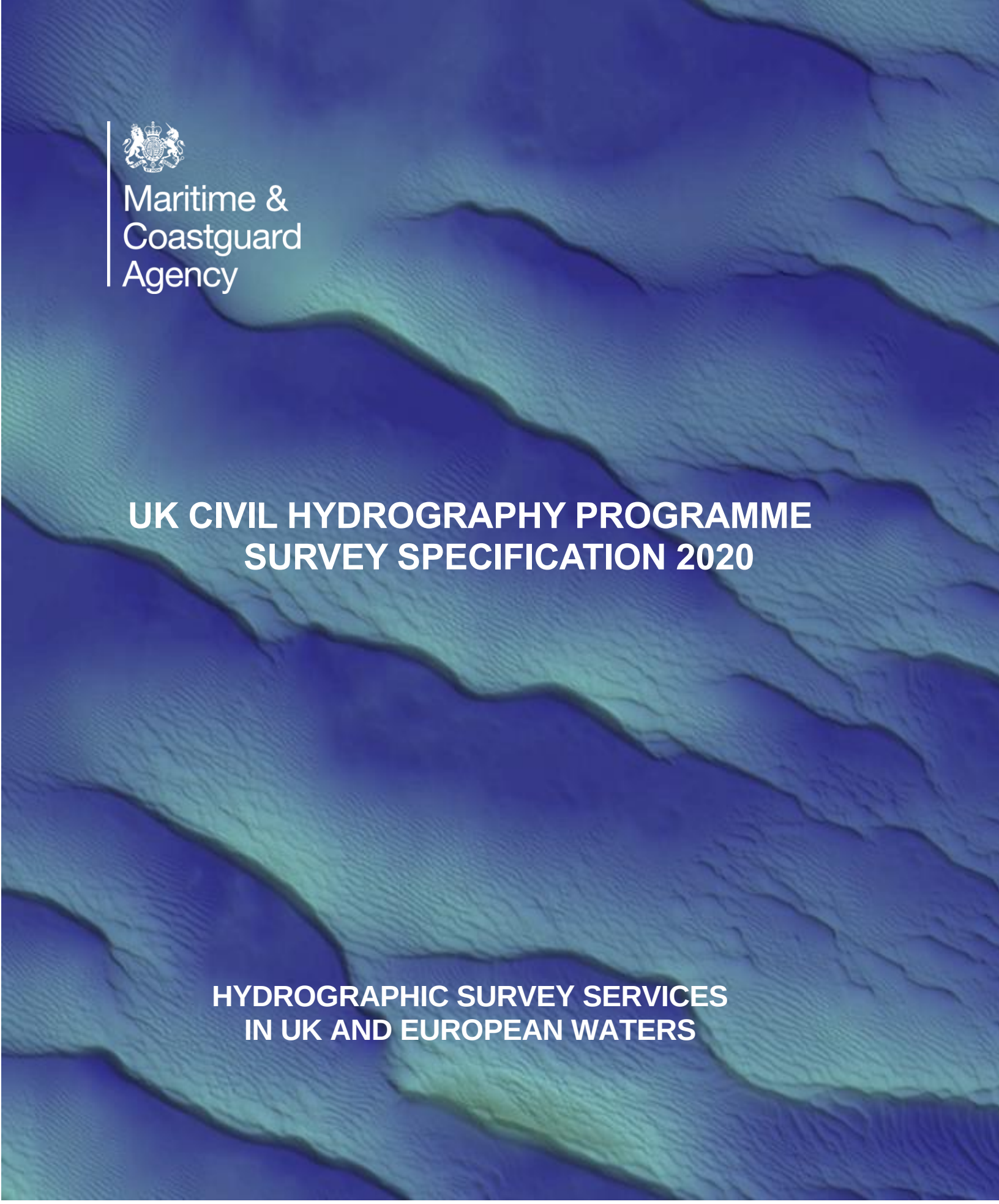

Maritime & Coastguard Agency

UK CIVIL HYDROGRAPHY PROGRAMME SURVEY SPECIFICATION 2020

HYDROGRAPHIC SURVEY SERVICES IN UK AND EUROPEAN WATERS

Maritime &
Coastguard
Agency

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RECORD OF CHANGES

The table below documents the version history of the UK Civil Hydrography Programme Survey Specification. The MCA Hydrography and Meteorology Manager has final sign off on all changes made to the specification.

Version	Date	Status	Approved	Signature
2018.01	16/02/2018	Final draft circulated for comments	Andrew Colenutt	
2018.02	26/02/2018	UKHO comments and minor amendments	Andrew Colenutt	
2018.03	09/03/2018	Final version	Andrew Colenutt	
2020.01	01/10/2020	Final version	Andrew Colenutt	

ABBREVIATED TERMS

ADCP	Acoustic Doppler Current Profiler
AtN	Aids to Navigation
BM	Benchmark
CD	Chart Datum
CHP	Civil Hydrography Programme
CORS	Continuously Operating Reference Station
DGPS	Differential Global Positioning System
DPR	Daily Progress Report
ETRS89	European Terrestrial Reference System 1989
GDOP	Geometric Dilution of Precision
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GRS80	Geodetic Reference System 1980

GSF	Generic Sensor Format
HI	Hydrographic Instruction
IHO	International Hydrographic Organization
MAIB	Marine Accident Investigation Branch
MBES	Multibeam Echosounder System
MCA	Maritime & Coastguard Agency
MSL	Mean Sea Level
OD	Ordnance Datum
PPP	Precise Point Positioning
QC	Quality Control
RINEX	Receiver Independent Exchange Format
RoS	Report of Survey
RTK	Real Time Kinematic
SBES	Single Beam Echosounder System
SIC	Surveyor In Charge
SV	Sound Velocity
SVP	Sound Velocity Probe
THU	Total Horizontal Uncertainty
TPU	Total Propagated Uncertainty
TVU	Total Vertical Uncertainty
UKHO	United Kingdom Hydrographic Office
UTM	Universal Transverse Mercator
VORF	Vertical Offshore Reference Frame
WADGPS	Wide Area DGPS (i.e. multiple reference station)
WCD	Water Column Data
WGS-84	World Geodetic System 1984
WPR	Weekly Progress Report

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ACKNOWLEDGEMENTS

The UK CHP Survey Specification has evolved over time from previous iterations, with technical input from the United Kingdom Hydrographic Office (UKHO) and contributions from other Maritime Administrations, Hydrographic Offices, contractors and other MCA and CHP stakeholders.

1. Hydrographic Survey Specifications – Shipping Lane 2 (v1.2) 17/10/00 *Land Information New Zealand*
2. Technical Specifications for HI 1059 Western Approaches to English Channel 20/08/03 *United Kingdom Hydrographic Office*
3. Hydrographic Survey Specification: Routine Resurvey Contract. 05/01/06. *Maritime and Coastguard Agency*
4. Hydrographic Survey Services Specification: MV Anglian Sovereign. 25/02/10 *Maritime and Coastguard Agency*
5. UK Civil Hydrography Programme: Survey Specification v 1.3. 22/05/12. *Maritime and Coastguard Agency*
6. UK Civil Hydrography Programme: Survey Specification 2018. *Maritime and Coastguard Agency*

INTRODUCTION

The UK, as a contracting government to the United Nation Convention of Safety of Life at Sea (SOLAS), has an obligation to 'arrange to collect and compile hydrographic data and to publish, disseminate and update all nautical information necessary for safe navigation' (SOLAS V, Regulation 9). The Department for Transport has delegated the responsibility to meet this obligation to the Maritime & Coastguard Agency (MCA). The MCA is an Executive Agency of the Department for Transport.

The MCA funds, manages and delivers the UK Civil Hydrography Programme (CHP) to prioritise the survey and mapping of UK Home Waters, an area in excess of 720,000km^2. The CHP continues to provide high-quality hydrographic data that underpin the production of national nautical charts and publications, and to maximise the benefit to maritime safety, the marine environment and efficient maritime transport.

CHP work packages are categorised as follows:

- Shallow Water
- Medium Water
- Routine Resurvey

Shallow Water refers to work packages typically in 0-200m water depths, predominantly shallower depths (less than 40m).

Medium Water refers to work packages typically in 0-200m water depths.

The CHP makes extensive use of Geographic Information Systems (GIS) to prioritise survey areas using a contemporary risk analysis methodology capable of reflecting the changing pressures on navigation safety and the maritime environment.

To ensure data is gathered to the highest possible quality for navigational charting, technical personnel from the MCA and the UKHO routinely visit CHP survey vessels during scheduled operations to verify data integrity. Prior to final survey data being accepted from contractors, it passes through a rigorous quality assurance appraisal process at the UKHO, where checks are made against items such as data density, inter-line consistency, geodetic parameters and tidal observations, for example. Once data has passed verification, it is archived to the UKHO's hydrographic database ready for inclusion in their range of Admiralty products.

The UKHO hosts the Marine Environment Data and Information Network (MEDIN) Data Archive Centre (DAC) for bathymetry data. Bathymetry data collected through the CHP are made freely available to visualize and download from https://www.gov.uk/guidance/inspire-portal-and-medin-bathymetry-data-archive-centre

The British Geological Survey hosts the MEDIN DAC for geology, geophysics and backscatter data. Backscatter data collected through the CHP are made freely available to visualize and download from http://www.bgs.ac.uk/GeoIndex/offshore.htm

SCOPE

The UK CHP Survey Specification details the CHP-specific requirements for conducting hydrographic surveys undertaken on behalf of the MCA, in order to deliver UK requirements and services. This document is to be used in conjunction with the relevant Hydrographic Instructions (HI) in order to fully detail the requirement of the survey(s).

STANDARDS

All requirements in the most recent versions of the following publications are to be adhered to in every respect in conjunction with this specification:

- Standards for Hydrographic Surveys. Special Publication No. 44. Edition 6. International Hydrographic Organization.

The most recent versions of the following publications should be referred to for additional information and guidance:

- The Mariner's Handbook (NP100). United Kingdom Hydrographic Office.
- Admiralty Tidal Handbook NP122 No.2. United Kingdom Hydrographic Office.
- Admiralty List of Lights and Fog Signals Volume A (NP74). United Kingdom Hydrographic Office.
- Admiralty Sailing Directions. United Kingdom Hydrographic Office.

TECHNICAL REQUIREMENT

1. PERSONNEL		
1.1	**Charge Surveyor**	For each survey platform a Charge Surveyor (also termed as Party Chief or Surveyor in Charge) shall be on site at all times during survey operations. The Charge Surveyor shall have completed an IHO/FIG Category A accredited hydrographic survey course (or equivalent) and have 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 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. The Contractor will provide MCA with the CV for each proposed Charge Surveyor in advance of commencement of survey operations and seek approval from the MCA prior to their deployment on survey operations.
1.2	**Survey Team**	Survey teams shall include adequately qualified and experienced personnel capable of supporting all aspects of hydrographic survey in complex offshore areas for nautical charting purposes, and office-based staff responsible for data compilation and quality assurance.

2. SAFETY		
2.1	**Responsibility**	Equipment and survey personnel provided by the Contractor for work in connection with the contract shall be the Contractor's responsibility at all times. Any loss, injury or damage suffered or caused by them shall be at the Contractor's risk throughout, but must be reported to MCA immediately and any other relevant authority, including MAIB.
2.2	**Safety Management Plan and Emergency Response Report**	Details of the Contractor's Safety Policy, Safety Management Plan and Emergency Response Report shall be supplied to the MCA prior to survey operations being undertaken for each HI.
2.3	**Drugs and Alcohol Policy**	The Contractor shall have a drugs and alcohol policy, which forbids the presence of drugs or alcohol in vessels or offices used under this contract. The policy must include random drug and alcohol testing. MCA reserve the right to request evidence of the regime in place at any time throughout the life of the contract.
2.4	**Daily Meetings**	The Charge Surveyor shall hold daily "Toolbox Meetings" with members of the navigational watch. Meetings shall be minuted (briefly), posted in the mess and shall include the following headings as a minimum: • Date, Time, List of attendees • Activities - Last 24 Hours • Planned Activities – Next 24 Hours • Safety / Hazards
2.5	**Work in poorly surveyed waters**	The Vessel Master is responsible for the overall navigational safety of the vessel and crew. If the Master considers that there is a conflict of interest in terms of the safety of the vessel and crew with regard to the proposed survey areas, the Master has the overriding authority to refuse to survey those areas. The Contractor shall have an appropriate 'Shallow Water Working' procedure as part of their quality and safety management systems.
2.6	**Medical Certification**	All offshore survey personnel must have a valid UK ENG1 medical fitness certificate or an MCA accepted equivalent. Evidence of certification may be requested by the MCA at any time.
2.7	**Safety Training Certification**	All offshore survey personnel must have in-date certification to demonstrate completion of the STCW 78 as amended Basic Safety Training package including: • Personal Survival Techniques (STCW A-VI/1-1) • Fire Fighting and Fire Prevention (STCW A-VI/1-2)

		• Elementary First Aid (STCW A-VI/1-3) • Personal Safety & Social Responsibility (SCTW A-VI/1–4) (Note that survey personnel and supernumeraries may alternatively have in-date certification to demonstrate completion of an Offshore Petroleum Industry Training Organisation approved course adhering to the "Minimum Industry Safety Training Standards"). Evidence of certification may be requested by the MCA or its representatives at any time.
2.8	**Familiarisation Training**	All offshore survey personnel must undertake familiarisation training prior to sailing, which must ensure attendees are able to: • Communicate with other persons on board on elementary safety matters and understand safety information symbols, signs and alarms; • Know what to do if: a person falls overboard; fire or smoke is detected; the fire or abandon ship alarm is sounded; • Identify assembly and embarkation stations and emergency escape routes; • Locate and don lifejackets and immersion suits if carried; • In the event of a fire know how to raise the alarm and have a basic knowledge of the use and types of portable fire extinguishers; • Utilise smoke hoods or emergency escape breathing device if carried; • Be familiar with the location of first aid kits and AED devices; • Take immediate action upon encountering an accident or other medical emergency, before seeking further medical assistance on board; and close or open the fire, weathertight and watertight doors fitted in the particular ship, other than those for hull openings. Evidence of training may be requested by the MCA or its representatives at any time.

3. VESSEL		
3.1	**Vessel Inspections**	Each vessel tasked with survey under the CHP shall be subject to approval (via an MCA Marine Office inspection) prior to survey work commencing under the contract. The 'Approval Inspection' will be required for both UK and Foreign Flag vessels. Repeat annual inspections shall be undertaken throughout duration of the contract. Vessels shall be inspected in the UK, however, where an overseas port is closer to the survey area for transit, crew change and onboard supplies, a vessel may be inspected overseas. The 'Approval Inspection', will be chargeable to the Contractor. Where MCA requests a repeat annual inspection, MCA will cover the cost and will be part of the MCA's normal activities and be recorded as a Port State Control inspection/inspection of a Foreign Flag vessel/Code Vessel inspection as appropriate. Any inspections overseas will be charged to the Contractor, unless it is an annual inspection and the overseas port is the closest port to the particular survey area for transit, crew change and taking onboard supplies. The operator must cover travel costs. Should a vessel utilised on the CHP be detained following an inspection, then the MCA reserves the right to refuse that vessel to continue working on the CHP.
3.2	**Vessel Flag**	UK Flag vessels are preferred. The term "UK Flag" includes not only those vessels flagged in the UK but also flagged within the Red Ensign Category 1 and 2 Registers operated by the UK Overseas Territories & Crown Dependencies. Vessels registered with a Flag State on either the Black or Grey List will not be accepted for the purposes of the CHP.
3.3	**Vessel Risk Profile**	Should a foreign flag vessel over 24 metres employed on CHP work receive a Ship Risk Profile of High Risk Ship (HRS), then MCA reserves the right to remove this vessel from the contract until the Ship Risk Profile is deemed to be Standard Risk Ship (SRS) or Low Risk Ship (LRS).
3.4	**Vessel Commitment**	Once a vessel has been tasked to a HI, the Contractor should seek MCA's prior agreement to remove or replace the vessel with another. MCA will only approve a vessel replacement if the oncoming vessel is an appropriate like-for-like exchange and continues to abide by the requirements of the specification and tender bid.
3.5	**Vessel and Technical Office Visits**	All vessels and offices utilised for CHP contracts shall receive visits (physical or virtual, depending on circumstances) by MCA and/or UKHO. Vessel and technical office visits are primarily intended to focus on the quality of hydrographic processes and deliverables but will also include an informal assessment of safety aspects onboard. If significant safety concerns are raised, then the contract overseer shall ensure that the local MCA Marine Office is made aware and a vessel inspection shall be arranged.

4. BATHYMETRY		
MULTIBEAM ECHOSOUNDER BATHYMETRY		
4.1	**Primary Depth Sensor**	Depth will be measured throughout the survey area using a multibeam bathymetry system capable of meeting all requirements stated below. The Contractor shall provide empirical evidence of each system's ability to meet the stated requirement to the MCA as a tender deliverable.
4.2	**Uncertainty**	Sounding uncertainty (in three dimensions) shall be in accordance with IHO Order 1A, as defined in IHO S44 Edition 5. Total Horizontal Uncertainty (THU) and Total Vertical Uncertainty (TVU) values must be calculated at/for each valid sounding, and be representative of the spread of data. These values must be inclusive of but not limited to the following components: temporal and spatial effects, equipment, systematic and random errors in survey system and platform configurations. The Contractor shall provide a fully developed uncertainty model to the MCA and UKHO prior to survey operations commencing. The model shall state all component uncertainties, as well as the combined Total Propagated Uncertainty (TPU).
4.3	**Object Detection**	For all parts of the survey area, the minimum size of object detected shall be: • Cube with sides of 2m in depths < 40m • Cube with sides of 10% of depth in depths >40m
4.4	**Sounding Density**	Each object (see 4.3) is to be detected by at least 3 valid data points in the along-track direction and 3 valid data points in the across-track direction, forming a minimum 3x3 grid of 9 data points. To monitor compliance with the Target Detection requirements for a given area, a minimum sounding density of 9 accepted soundings will be achieved in the following bin sizes: • Bin with sides of 2m in depths < 40m • Bin with sides of 10% of depth in depths >40m To ensure insonification to define the object on the seabed the centre-to-centre distance of each sounding (i.e. the bore-site spacings) should be no more than half the required target dimension apart.
4.5	**Acoustic Coverage**	Full seafloor coverage shall be achieved to the defined depth contour as detailed in the HI. Where a survey block lies adjacent to the coastline, data coverage (meeting the above requirements) shall extend into the 2m CD depth contour unless specified differently in the HI.

4.6	**Crosslines**	A minimum of 4 bathymetric crosslines shall be run for each HI, at approximately equal spacing, with an optimum of 4 crosslines for each survey block. These crosslines shall be approximately perpendicular to the typical mainline orientation in that block. Crosslines shall be rendered in folders separate from the mainline data structure, and the data should be cleaned as per 4.11 to allow for a statistical analysis. A statistical analysis between a cross-line and the main data set is not required in the RoS; the UKHO will undertake their own analysis against compliancy with IHO depth accuracies.
4.7	**Wreck Investigations**	All suspected (or obvious) wreck located during the course of the survey shall be reported (with respect to position, orientation, extent and least depth). All wrecks are to be investigated by running one survey line, centred over the centre of the wreck and orientated along the major axis, followed by two further parallel lines offset either side from the major axis. Sufficient lines run at right angles to the first so as to cover the entire length shall also be run. All investigation lines are to be run at as slow a speed as is possible, to maximise the sounding density. The Contractor shall clearly indicate within the RoS whether the least depth for each wreck has been determined by the real-time bottom detect, by analysis of multibeam bathymetry WCD or by other means if previously agreed by the MCA. For some Routine Resurvey areas only, wrecks that do not require investigation (because they have been fully investigated in previous years) will be shown in the HI Wrecks List as: "/FOR INFORMATION. NO SPECIAL SEARCH NOW REQUIRED" "@ NO FURTHER INVESTIGATION REQUIRED" However, if the mainline bathymetry indicates that these wrecks may now be shoaler than charted, a full investigation should be undertaken. All Wreck Investigations are to be reported using 'Report of Wrecks and Obstructions' (H525) form. Any uncharted wrecks located should be reported to MCA and UHKO within 24 hrs, using the H102 Hydrographic Note.
4.8	**Hazardous Obstructions**	If the Contractor identifies an obstruction that may be hazardous to surface or sub-surface navigation, the Contractor shall issue an H102 Note within 24 hours (as per 7.1) and contact the MCA. The MCA will determine whether an investigation is required on a case-by-case basis and instruct the Contractor accordingly.
4.9	**Multibeam Bathymetry Water Column Data**	Multibeam bathymetry water column data (WCD) shall be logged for further analysis during all wreck investigation lines. This data shall be analysed in an appropriate software package to compare the data digitised in real-time by the multibeam bathymetry with other features present in the water column. The Surveyor shall have the ability to re-

		pick fully georeferenced depths from the WCD for inclusion in the final sounding data if a shoaler depth over a given feature has been found within the WCD. The raw WCD and processed depths shall be imported into the final CARIS HIPS data structure, and be fully georeferenced and corrected for sound speed and tide. All WCD files are also to be rendered. The Contractor will supply views in the H525 showing representative water column imagery for each wreck to support the designation of least depth. The Contractor shall supply details of the procedure, software and file formats to be utilised for multibeam bathymetry WCD interpretation prior to survey operations commencing.
4.10	**Backscatter**	High resolution, geo-referenced multibeam backscatter data shall be collected to inform on seabed textural change and rendered in the proprietary format of the multibeam bathymetry system utilised. The Contractor shall endeavour to ensure that systemic variations to backscatter intensity are kept to a minimum and that gain, pulse length or any other system changes are minimised during data acquisition.
4.11	**Depth Data Precision**	Soundings shall be logged to at least two decimal places of a metre and presented as depths below Chart Datum.
4.12	**Data Cleaning**	All accepted soundings within the final bathymetric dataset shall fall within the IHO Order 1A uncertainty allowance. All systematic errors and obvious outliers shall be rejected from the bathymetric data. Data points falling within the Order 1a depth requirements but still numerically distant from the main dataset will still be regarded as outliers and should be rejected, but not deleted, from the dataset.
SINGLE BEAM ECHOSOUNDER BATHYMETRY		
Under Lot 3 - Routine Resurvey workscope, the potential requirement for singlebeam echosounding (SBES) has been retained to inform knowledge of the highly mobile shallow and inter-tidal banks covered by this workscope, and to permit their extents being adequately described on navigational products. It is not intended that SBES surveys will provide full coverage.		
4.13	**Primary Depth Sensor**	Where open spaced SBES lines are specified, depth will be measured using a SBES capable of meeting all of the requirements stated below. The Contractor may undertake the SBES lines using their MCA-approved CHP MBES system, in which case all MBES data must be fully cleaned and processed.
4.14	**Uncertainty**	Depth and position of sounding uncertainty shall be in accordance with IHO Order 1A, as defined in IHO S44 Edition 5.

4.15	**SBES Frequency**	The acoustic frequency of the SBES shall be between 100kHz and 300kHz. Only one frequency channel is required. The frequency of the transducer shall be clearly stated in the RoS.
4.16	**SBES Beamwidth**	The major axis of the beam-width of the SBES transducer shall be between 3° and 8°. The beam width of the transducer utilised shall be clearly stated in the RoS.
4.17	**SBES Calibration**	The SBES utilised shall be corrected for draft offset (from the GNSS antenna or water line as appropriate) and sound speed to ensure the depth and position uncertainty requirements are met throughout. The Contractor shall supply details of the SBES calibration procedure as a tender deliverable.
4.18	**SBES Sounding Density**	The along track density of valid soundings shall not exceed 5m.
4.19	**SBES Survey Line Spacing**	As specified in the HI.
4.20	**SBES Deviation from Planned Survey Lines**	The maximum deviation offline from the planned survey lines will be 20m, except in areas where an obstruction exists. Where an obstruction exists, the Contractor shall follow the route around the obstruction which offers the least deviation from the planned survey line.
4.21	**SBES Heave Compensation**	The effect of heave shall be minimised in the depth data by use of either a heave compensator or by GNSS smoothing techniques. The Contractor shall supply details of the method to be used for countering the effect of heave as a tender deliverable.
4.22	**SBES Depth Data Precision**	Soundings shall be logged to at least two decimal places of a metre and presented as depths below Chart Datum.
4.23	**SBES Data Cleaning**	All accepted soundings within the final bathymetric dataset shall fall within the IHO Order 1A uncertainty allowance. All systematic errors and obvious outliers shall be rejected from the bathymetric data. Data points falling within the Order 1a depth requirements but still numerically distant from the main dataset will still be regarded as outliers and should be rejected, but not deleted, from the dataset.

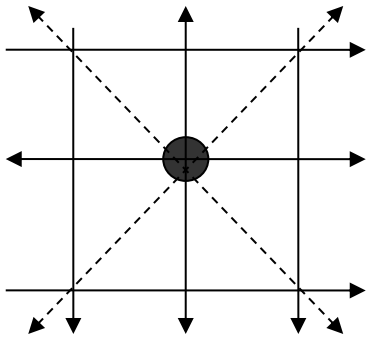
5. TIDES AND REDUCTION OF SOUNDINGS		
5.1	**Reduction of Soundings to Chart Datum**	Soundings are to be reduced to Chart Datum by using dual frequency carrier phase GNSS height observations combined with the VORF model and the Ordnance Survey Active Networks. Soundings are to be presented as depths below / heights above Chart Datum, as supplied by the UKHO and defined in VORF. The Contractor shall demonstrate that the method chosen for sounding reduction results in overall depth uncertainty requirements being met.
5.2	**Establishment of Shore-Based and Offshore (Seabed Mounted) Tide Gauges**	Coastal or offshore tidal stations may be required within the extents of an HI area. Supplementary tidal stations, and/or use of locally available permanently installed gauges, e.g. local Harbour Master, National Tidal and Sea Level Facility (NTSLF) or Regional Coastal Monitoring Programme tide gauges, may also be required. The HI for a particular area will confirm local requirements, and state tidal heights will be measured throughout the survey period and for a minimum of 30 days using a temporary or permanent tide gauge capable of meeting all of the requirements stated below. Automatic tide gauges (both onshore and offshore) should be capable of resolving water level measurement to ± 0.01m in height and ± 2 min in time. Heights must be recorded to at least 2 decimal places of precision and at sample intervals no higher than 5 minute resolution. Offshore (on non-vented) tide gauges shall be corrected for atmospheric pressure. Atmospheric pressure shall be recorded within 100km of the gauge location at a temporal resolution no greater than 6 hours.
5.3	**Pole-to-Gauge Calibration**	All temporary contractor-installed coastal tide gauges must be calibrated by reference to independent readings using a tide pole or 'top down air gap' measurements (e.g. by weighted tape measure from an appropriate reference mark which can be subsequently tied into the vertical control). 'Record of Tidal Observations' (H143) form must be used for this purpose to allow for both the transducer offset from datum and the scale error of the gauge. Readings are to be taken half-hourly as a minimum, with 10 minute interval readings taken for the duration of one hour before to one hour after high and low water. If observing at a location with a tide range in excess of 7m (or where the range is perceived to be changing rapidly) the observations are to be taken every 10 minutes, and every 5 minutes for the duration of one hour before to one hour after high and low water. Automatic coastal tide gauges installed by the Contractor only require a minimum 13 hour period of manual observations. When reading a pole in calm weather an accuracy of ± 0.03m should be attainable, with the time of each reading recorded to within ± 5 seconds of UTC; the same for a 'top down air gap' measurement technique.

		Reports on the Pole to Gauge comparison are also to be made on 'Summary of Checks on Automatic Tide Gauge' (H516) form. When a permanent / previously established tide gauge is given in the HI, the gauge zero versus Chart Datum connection stated in the HI may be required to be checked independently by means of a pole to gauge calibration to ensure the gauge is correctly calibrated (unless documented evidence can be provided in the RoS that this check has recently (within the last 6 months) been undertaken by appropriate owning authority). The HI for a particular area will confirm local requirements.
5.5	**Verification of VORF Model**	When requested in the HI, the Contractor shall perform a static validation of the VORF model at specified tide gauge locations (including both offshore and coastal gauges). This comparison shall be conducted by stationing each survey vessel within 1km of the tide gauge location for a minimum of 8 hours and logging corresponding water levels using the GNSS and VORF system, compared to the tide gauge data. This 8 hour period shall include successive high and low water events. The vessel shall be stationary during this period. The results should be presented in both tabular and graphical format in the RoS, and clearly demonstrate the relationship between the water line and the vessel reference frame. Comparisons between GNSS/VORF derived tidal heights for the vessel and the observed tidal heights (with co-tidal corrections) from the tide gauge(s) shall be made at regular intervals covering the entire survey period to confirm the VORF values and methodology.
5.5	**Tidal Stream Observations**	Some HIs may require tidal stream observations, which will be conducted in the locations listed in each HI. Unless stated otherwise in the HI, seabed mounted ADCPs will be deployed for tidal stream observations to enable a minimum of 30 days continuous data to be collected. These observations shall as a minimum obtain the Tidal Stream in the "surface" layer of the water column, which is to be representative over a depth of 5 - 10m below Mean Sea Level. The ADCP should also record the stream movement throughout the water column at appropriate bin sizes in order to achieve, at the very minimum, a 'mid-column' and 'near seabed' stream rates and directions. Bin size to be set to 0.5m in water depths of ≤20m, and 1m in depths >20m. If the ADCP is also capable of recording water level, this should also be enabled and supplied. The time interval of recorded tidal stream data (and height data if available) is to be every 10 minutes, preferably with each hour occurring 'on the hour'.

6. POSITIONING AND CALIBRATION		
GEODESY		
6.1	**Survey Geodesy**	Unless otherwise stated, every survey shall be rendered using the following geodetic parameters: Datum: ETRS89 Spheroid: GRS '80 Projection: UTM Grid Zone 29/30/31North (as specified in HI) All rendered positions shall be quoted as geographical co-ordinates (i.e. in terms of Lat / Long) as degrees and decimal minutes.
6.2	**Horizontal Accuracy**	The Horizontal Accuracy of all depths and positions shall be in accordance with IHO S44 Order 1a (5th Edition).
6.3	**Positioning**	Soundings are to be positioned by using dual frequency carrier phase GNSS combined with the Ordnance Survey Active Networks i.e. Post Processed Kinematic (PPK) GNSS. In some offshore locations, the Contractor may need to switch to Precise Point Positioning (PPP) techniques or utilise base stations from alternative networks. This will be permitted for an HI only by prior approval from the MCA. Post processed positions should ideally be integrated with the vessel attitude data to avoid bias associated with vessel motion. The Contractor shall demonstrate that the method chosen for sounding positioning results in the overall horizontal uncertainty requirements being met. Conventional Differential GNSS is acceptable for real time positioning (as these positions will later be discarded) – although more precise positioning may also be used if required by the Contractor. The Contractor will state methodologies for post-processed and real-time positioning as a tender deliverable.
SURVEY CONTROL		
6.4	**Establishment of Survey Control**	Three-dimensional position of any existing or newly established survey control shall be determined by dual frequency carrier phase GNSS techniques, tied in to the Ordnance Survey Active Network. A minimum of six hours of observations are required per station. The six-hour observation period should be divided into two three-hour sessions. At the end of the first session the antenna should be physically moved away from the mark and then re-established over the mark before commencing the 2nd observation session. The height of the static GNSS antenna should be measured before each session and clearly recorded and reported. If the height measured is a slope distance from the edge of the antenna, this shall be appropriately corrected to obtain the true vertical offset. The static GNSS antenna shall be positioned directly over the control point using an optical plummet. The absolute uncertainty with respect to ETRS89 for any existing or newly established survey control

		shall not exceed 1cm in horizontal and 2 cm in vertical at the 95% confidence level. Elevation masks should be selected appropriate for the surrounding site, but typically should be not less than 10°. The appropriate OD height and appropriate UTM coordinate for each station shall be computed. Where necessary, co-ordinate conversion shall be conducted using approved conversion programmes and an estimated final uncertainty stated.
6.5	**Optical Levelling**	To perform a redundant check on any control established and/or utilised, all control points shall be optically levelled from two pre-existing control points referred to the appropriate Ordnance Datum. The correct practices for traditional optical *Differential Levelling* are to be adhered to. In particular: • Prior to commencing a traverse, the correct calibration of the instrument is to be confirmed by performing a *Two Peg Test*. If required the instrument is to be adjusted and the test repeated to demonstrate that it meets the anticipated accuracy for the technique. The results of this test are to be recorded and presented as an attachment to the 'Levelling Reduction' (H532) Form. • Levelling is to be conducted between the 2 established control points, the tide pole and any existing benchmarks in the vicinity and provided in the HI. Levelling is to comprise a looped traverse, starting on the first known point and finishing on the second; no inter-sights shall be taken. Levels should be read and recorded to a precision of 0.001m. The maximum acceptable misclosure for a looped traverse is 0.02m. • Levelling is to be conducted using the *Three Wire* technique. • Levelling is to be conducted using *Foresights* and *Backsights* positioned at *Turning Points* in the traverse. The optical instrument is to be positioned at a point equidistant between the Foresight and Backsight with observations taken to both staffs. (The practice of setting up an optical instrument over the geodetic mark and making a single observation to a staff on the required new location is incorrect and is *not* to be used). • If an area exists over which it is impossible to run differential levels with balanced sights, a new geodetic mark should be established in a location which eliminates this requirement. If this is impossible or impractical then the correct *Reciprocal Levelling* technique is to be employed to bridge the gap. • Every effort shall be made to ensure that the survey staffs are held vertically whilst observations are being taken. An appropriately mounted bullseye bubble *Staff Level* shall be employed for this purpose.

		• A *Change Plate* is to be used to provide a footing for the survey staff at all *Turning Points*. • A *Staff Baseplate* with a pointed tip is to be used to allow precise measurements from a geodetic mark. When *Turning Points* are on hard surfaces (i.e. concrete or tarmac) the *Staff Baseplate* may be used in place of the *Change Plate*. • Levelling shall be recorded using the H532 Form. Any levelling field records should also be supplied, including the results of the *Two Peg Test*. The calibration certificate for the optical level is to be appended. In some cases, this levelling requirement may be replaced by an entirely GNSS based redundant technique upon agreement with the MCA, should pre-existing control prove unsuitable or non-existent.
6.6	**Station Marking and Documentation**	All geodetic stations established during survey operations shall be described, photographed and permanently marked to assist their future recovery. They shall be marked with either a stainless steel anchor bolt or a brass / bronze surveying bolt drilled into concrete in an area where they are unlikely to be disturbed. Stations shall not be established in tarmac. If the bolt is not an expanding anchor type then epoxy resin or similar should be used to secure. The bolt shall be punched to mark the precise horizontal measurement point. Stations deviating from the above requirements due to site conditions will only be permitted at the prior discretion of MCA. Descriptions of stations are to be recorded using 'Description of Geodetic Control Station' (H159) form. The description should include the coordinates and height of the station; a location description; a detailed description; list of other visible marks; visibility diagram and suitability for positioning fixing systems. Digital photographs, sketches, maps and/or chart extracts should be included to show views of the mark in situ and its immediate locality.
6.7	**Vessel Dimensional Control**	An appropriate dimensional control survey of each vessel to be utilised shall be conducted prior to commencement. Permanent and recoverable control points are to be established on each vessel utilised, coordinated to the vessel reference frame to within a tolerance ±0.01m relative (at the 95% confidence level) in X, Y and Z. All sensors shall be established within the vessel reference frame within a tolerance ±0.02m relative (at the 95% confidence level) in X, Y and Z. Where appropriate, the rotations of each sensor around the X, Y and Z axis shall be initially determined by the dimensional control survey to within ±0.2 degrees (at the 95% confidence level). These values may be later adjusted during the sonar patch test, if required. The centre of gravity (rotation) should also be estimated and its location within the vessel reference frame and method of establishment clearly stated in the RoS. A copy of the dimensional control report for each vessel shall be supplied with the RoS for each HI.

CALIBRATION		
6.8	**Multibeam Bathymetry Calibration**	A calibration of the multibeam bathymetry system and associated sensors (i.e. "patch test") shall be performed at the start of each survey season or after changing out or significantly reconfiguring any survey sensor (methodology shall be detailed in tender). Final post calibration repeatability shall be proven by means of the repeatability test detailed below.
6.9	**Static Positioning Check**	A static positioning check shall be performed at the start of each survey season or after changing out or significantly reconfiguring any survey sensor. The check shall monitor the three-dimensional position of either the primary GNSS antenna or another appropriate point within the vessel reference frame, for a period of no less than 30 minutes at a 1 minute resolution. The RoS should separately state the computed statistical reliability of both the horizontal position and the height measured. The positioning data to be compared will have been derived using the same procedures used to obtain all positions associated with the bathymetric data (i.e. post processed kinematic). Any local survey control utilised in this procedure shall be compliant with the requirements stated in Survey Control section.
6.10	**Multibeam Bathymetry Repeatability Test**	A multibeam bathymetry repeatability test shall be performed following calibration at the start of each survey season or after changing out or significantly reconfiguring any survey sensor (methodology shall be detailed in tender). This test should be conducted after the static position check as stated in the Static Positioning Check section. The test shall monitor the three-dimensional position of a clearly defined small but easily detectable feature on the seabed. The feature should be first surveyed near nadir from multiple directions – as a minimum from north, south, east and west. Secondly the feature should be boxed in, so that it appears in the outer beams on port for 2 lines, and the outer beams on starboard for 2 lines.  The subsequent report should separately state the computed statistical reliability of both the horizontal position and the depth measured for the feature.

6.11	**Vertical Offset Check**	A vertical offset gross error check shall be performed at the start of each survey season or after changing out or significantly reconfiguring any survey sensor (methodology shall be detailed in tender). The check shall compare the physical measurements of the distance from the primary and secondary GNSS antennas on the vessel to the seabed. This shall be performed in one location using a method entirely independent of the vessel's survey systems (e.g. level staff or leadline in a berth). These measurements shall be compared to data logged simultaneously in the same location using the vessel's survey system and software. The results should be compared and detailed in the RoS.
6.12	**Quality**	The Contractor shall provide a real-time indication of the quality of the 3D position and received augmentation data.
6.13	**Calibration Report**	The Contractor shall provide to the MCA within an agreed timeframe a draft report or summary of details following completion of each multibeam bathymetry calibration, static positioning checks, multibeam bathymetry repeatability, dimensional control and vertical offset checks. The full detailed calibration report(s) shall be included within the digital Report of Survey deliverable (see section 8.5).

7. GENERAL REQUIREMENTS		
7.1	**Hydrographic Notes**	Reports of significant differences to depths for a given area, particularly to the controlling depth, and any newly discovered dangers to surface or sub-surface navigation, shall be passed within 24 hours to the MCA Hydrography and Receiver of Wreck teams and to the UKHO using the 'Hydrographic Note' (H102) form.
7.2	**Eddies and Over-falls**	Observations of any eddies or over-falls which may be significant to small craft are to be rendered in the Report of Survey, stating the approximate geographic extents of such features, and how they relate to tidal and weather conditions. All charted eddies and over-falls must be reported on, even if to state that the current charted information is correct.
7.3	**Sound Speed**	The Contractor shall observe sound speed profiles at an interval consistent with the proposed error budget.
7.4	**Amendments to Sailing Directions**	The relevant Admiralty Pilot 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. If no changes to the relevant Admiralty Pilot are thought to be required by the Contractor, this should also be recorded in the RoS.
7.5	**Views for Sailing Directions**	Details of photographic views required to update existing views in the relevant Admiralty Pilot will be supplied in digital format as detailed in each HI. Views shall be supported by appropriate records in strict accordance with latest edition of NP100. Further to the requirements of NP100, digital cameras shall be used and must be either Single Lens Reflex or described by their manufacturer as a "Bridge" or "Bridging" camera and shall have at least 20M pixel resolution.
7.6	**Licences, Consents & Permissions**	The Contractor shall be responsible for arranging all licences, consents and permissions for access and frequency clearance for all survey operations whether ashore or afloat.
7.7	**Fixed and Floating Aids to Navigation**	The positions and characteristics of all fixed and floating aids to navigation visible from the survey area do not need to be reported. However, if navigationally significant differences between physical features and their depiction on the current Admiralty nautical charts and publications are detected, then this should be immediately reported to the relevant Port Authority and General Lighthouse Authority using the 'Hydrographic Note' (H102) form. The MCA and UKHO should be copied in to all correspondence of this type.

7.8	**Leading Lines & Tracks**	The leading lines and recommended tracks along channels and into harbours and anchorages marked by lights or fixed daymarks must be very carefully examined. If navigationally significant differences between physical features and their depiction on the current Admiralty nautical charts and publications are detected, then this should be immediately reported to the relevant Port Authority and the General Lighthouse Authority using the 'Hydrographic Note' (H102) form. The MCA and UKHO should be copied in to all correspondence of this type.
7.9	**Magnetic Anomalies**	Charted or newly discovered magnetic anomalies are to be investigated. The vessel should be steamed slowly in a wide octagonal shape centred on the charted anomaly, both to port and starboard, made with the standard magnetic compass on 8 equidistant points during each turn. The ship should be steadied on each heading for at least a minute before the observation to allow the sub-permanent magnetism resulting from the last course, to disappear. On each leg of the octagon, both magnetic and GNSS derived headings shall be logged and compared. Any anomaly found, or not found, shall be reported in the RoS, including the extent and magnitude of local variations.
7.10	**Fishing Industry**	Liaison with, and compensation to, fishermen for loss/damage to fishing gear are matters which rest entirely with the Contractor. The Contractor shall liaise closely with local fisheries groups and the appropriate local Fisheries Liaison Officer well in advance of the commencement of fieldwork.
7.11	**Daily and Weekly Progress Report**	Daily Progress Reports (DPRs) shall detail, for each active HI, survey operational progress, % of total survey coverage, planned activities, toolbox meetings, safety drills, etc., weather downtime and any problems encountered. DPRs shall be completed and e-mailed to the MCA and UKHO representative on a daily basis. A brief Weekly Progress Report (WPR) shall summarise, for each active HI, the survey operations, current vessel availability and future schedules, predicted milestone and completion and delivery dates, and include graphics of latest data coverage. WPRS shall be completed and e-mailed to the MCA and UKHO representative on a weekly basis.
7.12	**Quality Control**	Robust quality control procedures shall be provided and adhered to during processing of all data. Prior to survey operations commencing, and whenever updated, these procedures shall be provided to the MCA.

7.13	**Seabed Sampling**	Where requested in the HI, the nature of the seabed should be determined by seabed sampling. Seabed samples are to be collected on an approximate 5 km grid with at least one sample being taken in each major textural area identified from backscatter data. Seabed sampling will not be conducted until all bathymetry and backscatter for a given block or HI is complete, so as to inform the required positions for samples within the major textural areas. A maximum of three attempts should be conducted at each location in order for a sample to be obtained. Seabed samples are to be collected with the survey platform stopped in the water.
7.14	**Sample Preservation**	All seabed samples are to be retained and logged. Plastic screw top containers are to be used to preserve samples. The use of polythene bags for preserving retained samples is not acceptable. MCA shall confirm specific delivery details. Contractor to notify British Geological Survey and MCA with details of intent of delivery of physical sediment samples. Contractor shall submit completed digital H575 forms using BGS Data Portal. All seabed samples and hard copies of H575 forms are to be submitted to the British Geological Survey. British Geological Survey shall confirm receipt of delivery to MCA and Contractor.
7.15	**H575 form and Sample Photographs**	A 'Record of Seabed Samples and Cores' (H575) form shall be completed, accompanied with photographs of each sample on a plain white background with a ruler or scale bar clearly included.
7.16	**Data Management Details**	**Data Management details for MCA -** Contractors shall provide to MCA a confirmation of the number of files, folders and file sizes to be supplied and a Geotiff of coverage, to accompany submission of deliverables for each payment milestone assessment. **Data Management details for UKHO -** Contractors shall provide to UKHO a confirmation of the number of files, folders and file sizes to be supplied, to accompany submission of deliverables.
7.17	**Areas where planned coverage not able to be achieved**	If the Contractor identifies examples where the required coverage (as detailed in each HI) has not been fully achieved they shall contact MCA at the earliest opportunity. The MCA will consider each occurrence on a case-by-case basis and instruct the Contractor accordingly. The MCA may instruct the Contractor to complete a 'Coverage Exemption' form; a template shall be provided. The Contractor shall complete the 'Coverage Exemption' form and provide to MCA at the earliest opportunity for approval. The 'Coverage Exemption' form is part of the Report of Survey

8. DELIVERABLES		
8.1	**Shallow-Medium and Medium-Shallow Lots - Data Delivery Deadline**	All Shallow Water and Medium Water data and associated documents are to be rendered to the UKHO within 70 working days from the date agreed with the MCA.
8.2	**Routine Resurvey Lot - Data Delivery Deadline**	Unless otherwise stated in the HI, Routine Resurvey data and associated documents are to be rendered to the UKHO within 25 working days from the date agreed with the MCA.
8.3	**Appraisal Schedule**	If survey data are rendered to the UKHO within the relevant data delivery deadline, and the deliverables are fully compliant with the Survey Specification, the UKHO will endeavour to complete the validation process within 35 working days. If data are delivered to the UKHO earlier than these data delivery deadlines then the survey will be assigned to the next available slot in the UKHO appraisal schedule, or the original allocated slot, whichever is the soonest.
8.4	**Labelling of Records & Deliverables**	Each rendered item of digital data shall bear a depiction of the MCA logo, together with the project name, HI number and HI name, as follows: **Project Name:** **UK Civil Hydrography Programme** **Hydrographic Instruction Number and Name:** ***As detailed in each Hydrographic Instruction*** 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: Maritime & Coastguard Agency © CROWN COPYRIGHT 2018* (*year as appropriate).

8.5	**MBES Required Deliverables**	**Deliverables to UKHO** ▪ Processed (cleaned) sounding MBES data, shall be structured by Project, Vessel and Julian Day. Crosslines shall be rendered in a separate project. The proposed software version of CARIS HIPS to be used for processing and rendering of data shall be agreed by the MCA and UKHO prior to commencement of survey work. ▪ Projects must not be indexed and the data must be converted to full HDCS format. ▪ Raw (i.e. unprocessed) sounding data supplied in proprietary format containing full backscatter. ▪ Raw and processed Water Column Data from wreck investigations (and hazardous obstruction investigations when required) shall be imported into the final CARIS HIPS data structure. ▪ Backscatter mosaic in high resolution GeoTIFF format ▪ Seabed classification of backscatter data (digital seabed texture information) in ESRI shapefile format (see Annex A) ▪ Sound-speed records in ASCII format and a minimum of four records per day in H635 digital format. ▪ ADCP data (when requested in HI). ▪ The logging and export files used in the post-processing of GNSS position and motion. ▪ Digital Report of Survey (as supplied by the MCA): o Dimensional control/calibration/validation data o Survey Control Geodetic data (including reference station RINEX) o Wreck records (including Images showing the water column replay for each wreck investigated) o Tidal records o Amendments to any Admiralty Publications o Photographic views with supporting data o Seabed sampling records o Miscellaneous observations records **Deliverables to MCA following successful data appraisal by UKHO and issue of H628B form:** ▪ Specific data and reports will be requested at times.
8.6	**SBES Data Deliverables**	Processed and cleaned SBES data shall be rendered as a part of the final CARIS HIPS project for each HI. The proposed software version of CARIS HIPS to be used for processing and rendering of data shall be

		agreed by the MCA and UKHO prior to commencement of survey work. The SBES vessel and data shall be isolated from the MBES vessel and data using the conventional CARIS vessel hierarchy. Calibration data and crosslines shall be isolated from the main survey lines.
8.7	**Backscatter Mosaic**	The geo-referenced backscatter mosaic should be a representation of the backscatter intensity across the respective HIs. Artefacts (nadir stripping, poor data, etc.) and backscatter changes within homogenous areas shall be corrected for. If a survey area is too large to create one contiguous mosaic, then an individual mosaic for each block should be created. The resolution of the geo-referenced backscatter mosaic shall be the highest achievable.
8.8	**Seabed Classification**	A classification of seabed texture information shall be rendered as an ESRI shapefile (see Annex A Bottom Texture Deliverables). The Contractor shall interpret seabed textural changes across their respective HIs using a combination of the bathymetry, backscatter interpretation and ground-truthing from grab sampling. The Contractor shall provide details of the procedures and software to be employed as a tender deliverable.
8.9	**"H Forms"**	The Contractor shall use the appropriate "H Form", as supplied by the MCA.
8.10	**Digital Data Media**	The MCA shall provide details for delivery of rendered data, either utilising MCA online data transfer system or USB 3.0 hard drives (or equivalent). No rendered data file shall be larger than 2 Gigabytes in size. The contractor shall provide all USB 3.0 media required for this purpose.
8.11	**Report of Survey (RoS)**	The Contractor shall use the digital Report of Survey (RoS) for each HI, as supplied by the MCA.
8.12	**Tidal Data**	Tide gauge records, including raw tide heights and metadata, are to be submitted either in text file format (ASCII) or Microsoft Excel format (.xls). Metadata pertinent to the deployment, which as a minimum must include: • Position of instrument • Depth of water at the deployment site • Start/ End of deployment time and date • Units in metres
8.13	**Tidal Stream Data**	An Excel spreadsheet containing the metadata about the deployment: • Position of instrument • Depth of water at the deployment site • Height of instrument above the seabed

		• Start/ End of deployment time and date
		• Local variable parameters
		  o Magnetic Variation
		  o Mean Water Density
		  o Barometric Pressure
		If the seabed mounted ADCP is also able to record tidal height data, then this must be configured in the deployment and supplied in Excel or netCDF format, either accompanying the main tidal stream data or in a separate tab / spreadsheet.
		The stream data in the Excel spreadsheet must be displayed for each bin recorded in departures East and North, as well as Magnitude and Degrees (true). Units of the rates must be clearly stated.

8.14	**Comparison with Published Charts**	The sounding detail shown on the latest 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.
8.15	**Retention of Data**	All raw and processed digital records shall be retained and maintained by the Contractor for a period of 3 years from the date of the final contract payment. On completion of this 3-year period, the Contractor may seek permission from MCA to dispose of the data as they so wish.

Annex A Bottom Texture Deliverables

A.1 ESRI Format Definition

The following requirements describe the typical types of features to be included for Bottom Texture deliverables. Each survey is unique and, as such, not all of the types of features may be found in an individual survey. The Report of Survey should detail the types of Bottom Texture information that has been found and delivered.

Each type of Bottom Texture feature has a number of attributes to be included**.** The attributes listed are based on information required by the UKHO and are not absolute - extra features and/or attributes may be added at the discretion of the surveyor, e.g. individual or areas of fish farms.

Note that due to a 10-character limit on Field Names for Shapefiles, a Field Alias is included for all attributes to aid the end users' understanding. If a File Geodatabase is supplied then there is no such limitation and the Field Names may mirror the Field Alias'.

Where Bottom Texture deliverables require a Texture Code and Description, these are stated below and are based on the Folk Sediment Classification.

Texture Code	Texture Description
0	Rock / Sediment Absent
1	Mud
2	Sandy Mud
3	Muddy Sand
4	Sand
5	Gravelly Sand
6	Gravelly Muddy Sand
7	Gravelly Mud
8	Muddy Gravel
9	Muddy Sandy Gravel
10	Sandy Gravel
11	Gravel
12	Pelagic Ooze

Texture Descriptions and Codes (based on Folk classification)

Bottom Texture Information can be supplied in one of two ways:

I. A collection of Shapefiles (Details of the ESRI Shapefile spatial data format can be found at: http://www.esri.com/library/whitepapers/pdfs/shapefile.pdf).

II. A single file geodatabase containing a collection of feature classes.

A1.2 MCA Format Requirements

With reference to the CHP, the term 'Shapefile' refers to either a Feature Class or a Shapefile depending on the chosen method of supply of bottom texture information.
Shapefiles must have the appropriate assigned coordinate system, and may only hold features with the same geometry, which is defined as either point, line, or polygon. Each bottom texture information Shapefile shall contain all instances of that feature type. For example:

- All Seabed Samples are held together in a single point Shapefile.
- All Sandwave Crests are held together in a single line Shapefile.
- All Texture Areas are held together in a single polygon Shapefile.

Polygon Shapefiles must be of polygon type (not polygon ZM or other type).

Where Shapefiles contain adjacent polygons, these shall join together such that there are no overlaps or gaps.

ESRI ISO 19115 Metadata shall be fully populated and must include geospatial information.

A1.3 Types of Features Required for Bottom Texture Shapefiles

A1.3.1 Polygon Shapefiles

Shapefile Name: **Texture_Area**

Attributes:

Field Name	Field Alias	Field Type	Example
Code	Texture Code	Short Integer	2
Descript	Texture Description	Text	Sandy Mud
Comments	Comments	Text	

This Shapefile shall encompass the entire survey area (as detailed in each Hydrographic Instruction) such that no gaps shall remain.

Shapefile Name: **Sandwave_Area**

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Aspect	Aspect	Text	Asymmetric or Symmetric	N/A	Symmetric
Height	Height (m)	Double	Metres	1 decimal place	2.7
Orient	Orientation (degrees)	Short Integer	Degrees	Whole number	155
Wavelength	Wavelength (m)	Double	Metres	1 decimal place	25.0
Comments	Comments	Text			

For the purposes of the CHP a sandwave is defined as a mobile bedform having a height greater than 1 metre. Features smaller than this shall be classed as ripples. Where many sandwaves occur in groups these shall be classed as a Sandwave Area. The values given for Aspect, Height, Orientation and Wavelength shall be chosen to give a general description of the sandwaves found in this area. Where one or more of these values changes a new polygon shall be created.

Shapefile Name: **Ripple_Area**

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Height	Height (m)	Double	Metres	1 decimal place	0.7
Orient	Orientation (degrees)	Short Integer	Degrees	Whole number	270
Wavelength	Wavelength (m)	Double	Metres	1 decimal place	57.6
Comments	Comments	Text			

For the purposes of the CHP a ripple is defined as a mobile bedform having a height less than 1 metre. Features greater than this shall be classed as sandwaves. Where many ripples occur in groups these shall be classed as a Ripple Area. The values given for Height, Orientation and Wavelength shall be chosen to give a general description of the ripples found in this area. Where one or more of these values changes a new polygon shall be created.

Shapefile Name: **Ribbon_Area**

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Type	Type	Text	Sand or Gravel	N/A	Gravel
Orient	Orientation (degrees)	Short integer	Degrees	Whole number	270
Comments	Comments	Text			

Shapefile Name: **Scour_Area**
Attributes:

Field Name	Field Alias	Field Type	Units	Example
Type	Type	Text	Ice or Trawl	Trawl
Comments	Comments	Text		

For the purposes of the CHP scour is the excavation of sediment from the seabed creating a topographic low. Typically caused by strong currents that can be modified by seabed objects or local topography. Also applies to features caused by objects dragged along the seabed e.g. anchors and fishing gear.

Shapefile Name: **Vegetation_Area**

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Type	Type	Text	Kelp or Weed	N/A	Kelp
Height	Height from seabed (m)	Double	Metres	To nearest 0.5 metre	4.5
Comments	Comments	Text			

A1.3.2 Line Shapefiles

Shapefile Name: **Bedrock_Scarp**

Attributes:

Field Name	Field Alias	Field Type	Example
Comments	Comments	Text	

Shapefile Name: **Cable**

Attributes:

Field Name	Field Alias	Field Type	Units	Example
Type	Type	Text	Power or Telecommunications	Power
Comments	Comments	Text		

Shapefile Name: **Pipeline**

Attributes:

Field Name	Field Alias	Field Type	Units	Example
Type	Type	Text	Oil or Gas	Gas
Comments	Comments	Text		

Shapefile Name: **Ridge**

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Type	Type	Text	Sand, Gravel or Rock	N/A	Gravel
Height	Height (m)	Double	Metres	1 decimal place	2.1
Width	Width (m)	Double	Meters	1 decimal place	2.0
Orient	Orientation (degrees)	Double	Degrees	Whole number	015
Comments	Comments	Text			

Shapefile Name: **Sandwave_Crest**

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Aspect	Aspect	Text	Asymmetric or Symmetric	N/A	Symmetric
Height	Height (m)	Double	Metres	1 decimal place	3.4
Direction	Direction (degrees)	Double	Degrees	Whole number	070
Comments	Comments	Text			

The values given in Direction field shall describe the direction of the steepest side of the sandwave crest. Where isolated sandwaves are found these shall be identified and delineated. Individual sandwaves need not be included in this shapefile where a Sandwave Area polygon has been identified and created.

Shapefile Name: **Scour_Line**
Attributes:

Field Name	Field Alias	Field Type	Units	Example
Type	Type	Text	Ice or Trawl	Ice
Comments	Comments	Text		

A1.3.3 Point Shapefiles

Shapefile Name: **Pockmock**
Attributes:

Field Name	Field Alias	Field Type	Example
Comments	Comments	Text	

Shapefile Name: **Seabed_Sample**

Attributes: To be an exact copy of the 'Record of Seabed Samples and Cores' (H575) form spreadsheet.

The CHP_H575.xls file has been designed in such a way that it can be directly brought into ArcGIS and converted into a Shapefile.

Shapefile Name: **Wreck**

Attributes: To be an exact copy of the 'Report of Wreck Investigation' (H525) form summary spreadsheet.

The CHP_H525_summary.xls file has been designed in such a way that it can be directly brought into ArcGIS and converted into a Shapefile.