

HYDROGRAPHIC DEPARTMENT
MARITIME AND PORT AUTHORITY OF SINGAPORE (MPA)
(Version : May 2002)

GENERAL SPECIFICATIONS FOR THE CONDUCT OF HYDROGRAPHIC SURVEYS

1 Engagement of Commercial Hydrographic Surveyor

The Contractor shall engage a hydrographic surveyor approved by MPA. The hydrographic surveyor should be accredited by the International Hydrographic Organisation /International Federation of Surveyors (IHO/FIG) Category A/B course or as approved by the MPA Chief Hydrographer and should produce documented proof of such accreditation. The Surveyor shall be responsible for all survey works carried out and for the submission of plans and reports. The Surveyor shall also ensure that all works are carried out in accordance with IHO Standards for Hydrographic Surveys S44.

2 Permission to Conduct Survey

The Surveyor shall apply in writing at least five (5) working days before the start of any surveys (eg. bathymetric, silt and current measurement) to the MPA Chief Hydrographer for permission to conduct each survey using the application form found in Annex 1.

3 Access to Inspect Survey Works

3.1 The MPA Chief Hydrographer or his representative shall at all reasonable times have access to the development sites and survey facilities.

3.2 The Surveyor shall arrange for check survey or survey inspection at the request of the MPA Chief Hydrographer or his representative.

3.3 All costs incurred for the above inspection or check surveys carried out by the MPA Chief Hydrographer or his representative shall be borne by the Contractor.

4 Survey Limits

4.1 The survey limits shall extend to at least 100 metres beyond the perimeter of the approved working limit or up to the adjacent sea-wall, wharf, coastline, etc. The survey limits shall be approved by the MPA Chief Hydrographer and shown in a drawing titled "Plan showing

Limits of Survey".

- 4.2 All structures, floating or fixed within the survey limits shall be surveyed and shown on the plan. Any obstructions detected shall be shown clearly on the survey plan. The composition or the nature of the obstructions shall be described in details in the report.
- 4.3 Hydrographic survey must cover up to High Water Line or Coastline where applicable. Drying lines shall be shown in details symbolised in accordance with the CHART 1 published by the MPA Hydrographic Dept. This publication is available from MPA's authorised chart distributor.

5 Method of Survey

The Surveyor shall obtain the approval of the MPA Chief Hydrographer or his representative on the method of surveying and for equipment to be used before the execution of the survey works.

6 Survey Equipment and Accuracy

- 6.1 Calibration The Surveyor shall ensure that the survey equipment that are to be used shall be appropriate for the scale of survey and shall be properly calibrated before they are used in any survey. The Surveyor shall maintain the calibration records and submit them to the MPA Chief Hydrographer or his representative for inspection.
- 6.2 Echo Sounder A dual frequency echo-sounder (viz. about 30 KHz and 210 KHz), providing depth accuracy of +/- 0.1 metre, shall be approved by the MPA Chief Hydrographer before being used for the sounding surveys. The echo-sounder shall be calibrated daily by Bar Checks, up to the maximum depth of the survey area and on the working phase of the echo sounder, before and after sounding. The records of such Bar Checks shall be marked on the same echo roll used for the particular day's sounding and shall be subject to inspection by the MPA Chief Hydrographer or his representative.
- 6.3 Horizontal Positioning System The horizontal positioning is to be controlled by Differential Global Positioning System (DGPS) or electronic positioning system providing an accuracy of +/- 1m or better.

7 Survey Scale

The survey scale shall be determined by the survey requirements.

8 Density of Soundings

Sounding lines shall be run at spacing of 5 mm on paper throughout the entire survey limits and at closer intervals where seabed is irregular and high spots are detected. Cross-lines shall be run at intervals of not more than 10 times the line interval of the sounding lines.

9 Sounding Datum

The Chart Datum to be used for the reduction of soundings shall be determined by the MPA Chief Hydrographer. The Chart Datum used shall be stated clearly in all survey plans and records.

10 Control Stations

The Surveyor shall be responsible for the accuracy of all control stations used for the survey irrespective of whether the station co-ordinates are provided by the MPA Hydrographic Department. All new control stations are to be connected to MPA control stations. Before the commencement of any survey, the Surveyor shall submit to the MPA Chief Hydrographer a plan at the survey scale showing all the control stations to be used for the surveys and a list of their respective co-ordinates and station descriptions.

11 Field Survey Records

The field records shall be maintained by the Surveyor for inspection at any time by the MPA Chief Hydrographer or his representative. These following records must be duly certified copies and submitted to the MPA:-

- a) Name of Surveyor;
- b) Echo trace and bar-check records;
- c) Daily record of fixes;
- d) Daily record of tidal height measurement;
- e) Record of field equipment calibration;
- f) Plots of the actual tracks travelled by the survey vessel;
- g) Sounding plots; and,
- h) Any other relevant records.

12 Survey Grid

The survey results shall be plotted on the SVY95 Survey Grid in metres based on the false co-ordinates 28 001.642 E, 38 744.572 N of Projection Origin at Latitude 01° 22' 00"N and Longitude 103° 50' 00"E on WGS84

Spheroid.

13 Tidal Corrections

Tidal readings for the reduction of soundings shall be taken from the MPA automatic tide gauge nearest to the survey area. See Annex 3. Tidal data can be obtained from the Hydrodynamics Section, Hydrographic Department.

14 Interpretation of Soundings

Soundings shall be plotted accurately and shown in the appropriate format. All high spots detected on the echo trace between fixes shall be plotted.

15 Survey Plans

15.1 Soundings shall be plotted at intervals of not more than 3 mm on plan along the entire sounding line.

15.2 Main sounding lines shall be plotted at intervals of not more than 5 mm on plan at survey scale.

15.3 Both survey and geographical grids shall be shown on the plan.

15.4 All symbols, abbreviations and terms depicted on the plan shall be in accordance with the CHART 1 published by the MPA Hydrographic Dept. Depths shown on plans shall be clear, legible and free from overplotting. Any heights of isolated features shall be shown.

15.5 Cross-sectional plans are to be drawn to a scale of 1:500 horizontal and 1:100 vertical.

15.6 Results of seabed sampling for post dredging survey shall be plotted on a separate plan at the same survey scale.

16 Depth Contours

Drying lines and depth contours of 2m, 5m, 10m, 15m, 20m and 30m shall be drawn on all relevant survey plans. The contours depicting the approved dredging/dumping depth shall also be drawn on the relevant survey plans.

17 Submission of Plans & Survey Records

17.1 Certification The Surveyor shall certify all plans, field records,

reports, data sheet, equipment calibration records, sounding plots, etc before submitting them to the MPA Chief Hydrographer.

- 17.2 Survey Plans The Surveyor shall submit at one (1) clear film and two (2) paper prints of the survey plans, not larger than AO size, to the MPA Chief Hydrographer.
- 17.3 Survey Reports The Surveyor shall submit a comprehensive survey report (2 copies) to the MPA Chief Hydrographer giving details on Outline of Operation, Field Operation, Data Processing, Finding, List of Accompanying Documents, and any other relevant information of each survey carried out by the Surveyor.
- 17.4 Computer Bathymetric Data File The Surveyor shall submit a set of all bathymetric survey data stored in 3.5" compact diskettes together with an index chartlet showing the surveyed areas covered by each data file and the co-ordinates for those points defining the surveyed areas. The data file shall be structured in accordance with format approved by the MPA Chief Hydrographer. See Annex 2.

18 Side Scan Sonar Survey

- 18.1 Upon completion of the entire works, a side scan sonar survey covering the limits of the hydrographic survey shall be carried out by the Contractor in the presence of the MPA Chief Hydrographer or his representative. The cost for the side scan sonar survey shall be borne by the Contractor.
- 18.2 The survey lines shall be run at 100m intervals with dual coverage and shall carry out in a manner to provide the scanned corridor of not less than 100% overlap. The survey shall be carried out using sonar range scale of 100 metres or lesser.
- 18.3 All obstructions, debris or other features lying on or protruding from the seabed located by the sonar survey shall be investigated, and identified by divers or by some other means acceptable to the MPA Chief Hydrographer or his representative.
- 18.4 The positions of all these features shall be plotted on 1:1000 scale survey plans. All debris or obstructions found shall be removed immediately by the Contractor at his own cost.

19 Side Scan Sonar Survey Report

The Contractor shall submit to the MPA Hydrographer a comprehensive side scan sonar survey interpretation report (2 copies) together with sonar trace, plans, and other relevant records duly certified by a qualified Geophysicist

approved by the MPA Chief Hydrographer.

20 Pre-Development Hydrographic Surveys

20.1 Pre-development survey of the area specified herein shall be conducted before commencement of any works.

20.2 Upon written requisition by the Contractor to the MPA Chief Hydrographer for the pre-development survey, the MPA Chief Hydrographer or his representative shall conduct or require the Surveyor to conduct the pre-development survey.

20.3 All expenses incurred by the MPA in the pre-development survey shall be borne by the Contractor.

21 Three (3) Monthly Interim Hydrographic Surveys

21.1 The Surveyor shall conduct 3 Monthly Interim Reclamation/Dredging Surveys of the area specified herein.

22 Post Development Survey

22.1 Upon written notification by the Contractor to the MPA Chief Hydrographer that the works over the survey areas have been completed, the MPA Chief Hydrographer or his representative shall conduct the post development survey, unless otherwise stated.

22.2 All original echo traces, field records, sounding plots, etc shall be retained by the MPA Chief Hydrographer.

22.3 Any high spots detected during this survey shall be cleared by the Contractor as directed by the MPA Chief Hydrographer or his representative.

22.4 All expenses incurred by the MPA in the post development survey and re-surveys shall be borne by the Contractor.

23 "As-Built" Surveys

23.1 The Contractor shall be responsible for carrying out the as-built surveys of the completed structures and topographical details such as wharf, jetty, slipway, drain, seawall etc.

23.2 The Contractor shall submit to MPA, the digital file, one clear film

and 2 paper prints duly certified by the Registered Land Surveyor at a scale of not smaller than 1 in 1000. A set of colour photographs of all newly constructed structures shall also be submitted.

24 Dumping Ground Survey

24.1 The Contractor shall conduct survey of the dumping ground and its approaches before the start of the dredging works. If the dumping period exceeds 5 months, interim surveys of the dumping ground shall be carried out by the Contractor at intervals of 3 months.

24.2 Level of Dumping The level of dumping shall not be shallower than the approved level specified in the Application for Disposal of Spoil. Any area found exceeding the approved level shall be removed immediately by the Contractor at his own cost to the satisfaction of MPA.

24.3 Removal of Silted & Illegally Dumped Material The Contractor shall be responsible for any significant seabed level changes, during the development and maintenance periods, due to siltation caused by the works or illegal dumping within the survey limits. The Contractor shall at his own expense, restore the affected areas to their original depths, to the satisfaction of the MPA or other Authorities

25 Aerial Photographs

25.1 Vertical and oblique aerial photographs of the entire working area including the shorelines shall be taken before commencement of work, at 6-monthly intervals through out the development period and on completion of all works.

25.2 The Contractor shall be responsible to make all the necessary arrangements and to obtain the necessary permissions from CAAS and MINDEF and to take up insurance cover for the persons on the flight for the aerial photography.

25.3 The Contractor shall submit two (2) copies (measuring not less than 250 mm x 200 mm) of each photograph to the MPA Chief Hydrographer.

26 Silt and Current Measurement

26.1 Silt Measurement

26.1.1 The silt meter shall be self-recording and be able to measure suspended sediments in milligrammes/litre (mg/l) in the range

from 0 to 200 mg/l. It shall be installed at mid-depth of the water column or at least 3-metre above the seabed.

26.1.2 The meter shall be specifically designed with a low power consumption and suitable for long term in-situ monitoring for the entire duration of the Project.

26.1.3 The recorded data output shall be directly converted from voltage to mg/l. The final output shall be in the unit of milligramme per litre and not FTU unit.

26.1.4 Sea water shall be used for the meter calibration. Formazin shall not be used.

26.1.5 The lens of meter shall be cleaned and serviced weekly, to reduce marine growth which may affect the meter's performance.

26.1.6 Data recording shall be at 5-minute intervals.

26.2 Current Measurement

26.2.1 The current measurement shall use the Acoustic Doppler Current Profiler (ADCP) and the ADCP provided shall be seabed mounted and upward looking. The ADCP shall be capable to automatically measure vertical profiles of horizontal water currents. It shall be self-contained to be mounted in a sinker on the seabed.

26.2.2 Should the ADCP be buoy mounted, the Surveyor should seek prior approval from the Port Masters Dept (MPA) for the buoy's location. Upon approval, the buoy's markings and light shall be specified by the Navigational Aids Section, Hydrographic Department (MPA).

26.2.3 The ADCP shall automatically record the average value over 10-minute intervals. Each data recording shall be the average of all valid data over the 10 minute intervals. The ADCP shall be able self check the data and reject erroneous data before recording.

26.2.4 The output of the recording data for speed shall be in centimetre/second and direction in degrees relative to True North.

26.2.5 The Surveyor shall propose to the Chief Hydrographer or his representative, the ADCP the mooring design and the proposed deployed location. Should the ADCPs be deployed

in shipping channels, the moorings must be dimensionally low profiled to reduce the likelihood of collision with passing vessels. The proposed sinkers for mounting the ADCPs must be resistant to corrosion.

26.2.6 The Surveyor must ensure that the deployed ADCP's tilt angle shall not exceed 5 degrees from the upright direction.

26.3 Data Formats and Reports

26.3.1 The application software shall be able to output the results of silt and current data in graphs and tabular ASCII format in dd/mm/yy hh:mm mg/l for silt and dd/mm/yy hh:mm speed (cm/s) direction (degrees) for current.

26.3.2 The application software shall operate on an IBM compatible PC under Window 95 (or higher) environment.

26.3.4 The technical manuals (in English) each of the proposed silt sensor, data logger and ADCP used shall be supplied to the Chief Hydrographer or his representative, for examination.

26.3.4 All equipment shall meet or exceed all the specifications spelt out in the specifications.

26.3.5 The Surveyor is to submit the following records to the Hydrographic Department every month :

- a). all recorded data and graphs of the measured silt and current records shall be stored in ASCII format on 3.5"diskettes; and,
- b) a monthly report (2 copies) in hard copy .

Note :

The MPA reserves the right to use the survey data for nautical charting purposes.

Hydrographic Department
Maritime and Port Authority of Singapore
460 Alexandra Road
#20-00 PSA Building
Singapore 119963

**APPLICATION TO CARRY OUT HYDROGRAPHIC SURVEY
MARITIME PORT AUTHORITY OF SINGAPORE (MPA)**

Application for permission to carry out HYDROGRAPHIC SURVEY within SINGAPORE TERRITORIAL WATERS.

(Application with complete particulars should reach The Chief Hydrographer, MPA at least five (5) working days before the commencement of survey).

To: The CHIEF HYDROGRAPHER, MPA - Fax No. 6278 7646

[A] PARTICULARS OF SURVEY:-

- 1) MPA'S COMET Approved Project No. :
Remarks :
- 2) A chartlet showing the geographic and Singapore co-ordinates of the survey limits and the MPA approved working limits must be attached.

Type & Purpose of Survey :
 Location & Project Title :
 Dates and Duration of Survey :
 Survey Launch Regn.No. :
 Echo Sounder (Brand & Model) :
 Positioning System (Brand & Model) :
 Any other survey equipment used :

[B] SURVEYOR'S PARTICULARS & UNDERTAKING

This survey must be conducted in accordance with the MPA General Specifications for Hydrographic Surveys. On completion of the survey, the survey plans (1 clear film & 2 paper prints) with report (2 copies), together with digital data files in MPA format, must be submitted to the MPA Hydrographic Department.

Surveyor's Signature :
 Date :
 Surveyor's Name :
 Tel. No. :
 Contact Person's Name :
 Fax No. :
 Survey Company's Name :
 Name of Client :
 Fax No. :

[C] For MPA's USE

Survey Application No. : SPN
(Please quote this number in your report)

To: The Surveyor

Your Survey Application is approved / not approved.

.....
Chief Hydrographer, MPA

.....
Date

MPA Tide Gauge to be used :

Please contact _____ to arrange for a MPA representative.

MPA - HYDROGRAPHIC DEPARTMENT

COMPUTERISED DIGITAL BATHYMETRIC SURVEY DATA FILE STRUCTURE

I. FILE STRUCTURE

FILE 1 - SURVEY INFORMATION FILE

Name of Company : (max 30 characters)
Project Title : (max 120 characters)
Client's name : (max 30 characters)
Name of Surveyor : (max 25 characters)
Vessel's name or Reg. No. : (max 25 characters)
Positioning System used : (max 20 characters)
Tide Station used : (max 20 characters)
Survey Area Limits : Min Easting, Min Northing (SVY95 grid)
 : Max Easting, Max Northing (SVY95 grid)
Scale of Survey : (1:500, 1:1000, 1:2500 or 1:5000)
Date of survey : (DDMMYY)
Type of survey : (select on of the types listed below)
Pre dredging survey
Post dredging survey
Pre construction survey
Post construction survey
Pre reclamation survey
Post reclamation survey
Pre removal survey
Post removal survey
Monitoring survey
Interim survey

Name of Survey Data file: (max 12 characters)
Data Processing Software: (state name or manual/digitised)
Data Processing Hardware: (name of PC/workstation)

FILE 2 - BATHYMETRIC SURVEY DATA FILE

Easting,Northing,Reduced Depth,Tidal Correction Value,Time,Date
Easting,Northing,Reduced Depth,Tidal Correction Value,Time,Date
Easting,Northing,Reduced Depth,Tidal Correction Value,Time,Date
.....
.....
.....
Easting,Northing,Reduced Depth,Tidal Correction Value,Time,Date

II. DATA FORMAT

Eastings and Northings should be in SVY95 Grid Metres to one place of decimal.

Reduced Depths should be soundings that have tidal corrections applied and reduced to Chart Datum. Depths should be in metres and at least to two places of decimal.

Tidal Correction Values should be in metres and at least to two places of decimal.

Time and Date should be in HH:MM:SS (24 Hours Clock) and DDMMYYYY formats respectively.

A new line should be used for every sounding. No blank lines or page breaks should be used in the Bathymetric Survey Data File.