

## **PORTS AUSTRALIA**

# **PRINCIPLES FOR GATHERING AND PROCESSING HYDROGRAPHIC INFORMATION IN AUSTRALIAN PORTS (Version 1.5 – November 2012)**

## **PREFACE**

These Principles have been prepared by the Hydrographic Surveyors Working Group of Ports Australia. They are intended for use in Ports and supplement the International Hydrographic Organization (IHO) Special Publication S-44 (Standards for Hydrographic Surveys) available from the IHO website: [http://www.iho.int/iho\\_pubs/standard/S-44\\_5E.pdf](http://www.iho.int/iho_pubs/standard/S-44_5E.pdf) . These Principles have been designed as performance standards and as such do not describe the detailed process that shall be followed to ensure the required standard of information is obtained and subsequently maintained.

## **SCOPE**

These Principles are primarily intended for (but not limited to) use in Australian ports where shipping regularly or on occasions operates with restrictions on Under Keel Clearance (UKC). They are targeted at the provision of hydrographic data that is used as input in a port's UKC formula.

The 'Principles for Gathering and Processing Hydrographic Information in Australian Ports' contain consistent and common criteria for the conduct of surveys in Australian ports. They have been designed to ensure that all relevant port authorities select the survey class, frequency and personnel required to ensure that the port's 'declared depth' provides confidence for port operations, and can be utilised in the port's UKC formula. The Principles do not set out how or what technologies should be used to achieve the required standard.

Appendix 1 of these Principles sets out the requirements for a survey to be Class A or Class B and particularly these which must be addressed in the 'Method Statement', as described in clause 3 of the Principles. The Method Statement is a critical part in ensuring that the selected class of survey can be achieved. It addresses the factors that must be considered when planning, carrying out, appraising and presenting the survey. Although there are many "givens" in carrying out any survey the technologies and frequency of survey will be unique to each port.

The professional expertise of the hydrographic surveyor to select the level and type of technology that is necessary to undertake a survey is critical to abiding by the Principles. These Principles do not attempt to provide a step by step manual on how to carry out a particular survey.

## **FOREWORD**

There has been increasing pressure on port operating authorities in both the commercial and safety areas to be able to justify, or in some cases defend, the inputs in their UKC formula. IHO Publication S-44 provides the minimum standards for hydrographic surveys; it also requires that surveyors strive to attribute all new data with a statistical estimate of its uncertainty. However S-44 does not address data currency, nor contain guidelines on evaluating whether the survey results are actually 'fit for their intended purpose'. There will inevitably be a degree of uncertainty in port survey data. This uncertainty varies, depending upon numerous factors including survey equipment, environmental

conditions, etc. A fundamental aim of these Principles is to ensure the resultant depth uncertainty can be recommended by the port surveyor for use in the port's UKC model.

In addition to the uncertainty of the soundings most ports that operate with a minimum UKC have developed dredged channels that can suffer from siltation that may result in a reduced depth available for shipping. As such the need for regular surveys is addressed in these Principles.

A critical part of ensuring that the required standard has been achieved is the documentation of procedures and processes that the supplier has used in producing the soundings. This documentation will usually be unique to each port and the surveying tasks within that port. **Appendix 1** sets out in broad terms the requirements that must be addressed in carrying out the survey, from planning through to data retention and presentation.

The detailed technical aspects of the tasks undertaken during the survey are included in the Method Statement. These will vary from port to port and with the technology that is available. With improvements in technology there will be a need to review and, where necessary, change the Method Statements. Where a port has a need to address a particular issue this should be documented and adopted as a procedure.

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References: 1. IHO Publication S-44 (Standards for Hydrographic Surveys) – 5<sup>th</sup> Edition, Feb. 2008  
2. IHO Publication C-13 (Manual on Hydrography)

## **1. PERSONNEL**

The hydrographic survey and other associated tasks will be carried out by, or directly supervised, by a suitably qualified and experienced or preferably an AHSCP Level 1 Certified Hydrographic Surveyor. The resulting information shall be certified by this person and shall state the class to which the information can be assigned. The surveyor should also be able to demonstrate a proven ability to undertake his/her task via evidence from previous clients of satisfactory performance in similar projects.

## **2. FREQUENCY OF SURVEYS**

The authority that declares the depth available for navigation shall develop with the supplier an agreed survey frequency for the supply of information and required quality and class of that information, notwithstanding peculiar/ad-hoc requirements highlighted in Section 4.1.1.

## **3. SURVEY METHODOLOGY**

It is recommended that each hydrographic surveyor develop and document a 'Method Statement' that can clearly demonstrate that the standard is adhered to for each type of survey. The Method Statement shall as a minimum address all of the elements of Appendix 1, 'Requirements To Achieve Class A Or Class B Survey'.

The following provide useful information on standards, 'method statement', etc.:

1. 'Standards for Hydrographic Surveys within Queensland Waters'  
<http://www.msq.qld.gov.au/Charts.aspx>
2. 'Standards for Hydrographic Surveys (HYSPEC) v3'  
<http://www.linz.govt.nz/docs/hydro/stds-and-specs/hyspec-v3-24-apr2001.pdf>

## **4. CLASS OF SURVEYS**

### **Preamble**

There are 2 classes of survey, 'A' and 'B'. The resultant depth "accuracy" for both classes is the same; the difference between the classes is the requirement for a Class A survey to use a survey method that ensures complete bottom coverage so that the minimum depth within the channel toe lines has been detected. Class B is designed for check surveys where a Class A survey has been previously carried out. Either survey will allow a review of the depth available for navigation by the appropriate authority. The definition of survey classes (A and B) should not be confused with 'Zone of Confidence (ZOC)' classifications, which refer to the quality of data used in the chart/ENC.

## **4.1 CLASS A**

### **4.1.1 Application**

Class A surveys are required for, but not limited to:

- Investigations of an area for a proposed new channel, anchorage, berths, swing basin, etc, the outcome of which will be the declaration of a navigable depth.
- Increasing the declared depth in a channel following maintenance or development dredging.
- Investigating a grounding or reported shoaling in an area.

### **4.1.2 Requirements**

For survey information to satisfy this class the following shall be met:

- The method or methods used to undertake the hydrographic survey within the waterway shall ensure that the minimum depth in the navigable waterway has been determined.
- The resultant reduced depths shall have a total vertical uncertainty equal to or better than the survey uncertainty component included in the port's UKC formula.

In all other respects the data emanating from a Class A survey is to meet the requirements for Special Order surveys in accordance with IHO Publication S-44.

## **4.2 CLASS B**

### **4.2.1 Application**

Class B surveys are designed for, but not limited to, check or depth maintenance surveys. The information should be of sufficient quantity and quality that allows the relevant authority to reduce the declared depth if necessary. It is a requirement of a Class B survey that a Class A survey has previously been carried out in the surveyed area.

Class B surveys are required for, but not limited to, initial investigations of any events that may have caused abnormal changes in the seabed. These are to be followed by Class A surveys in areas where deemed necessary.

### **4.2.2 Requirements**

For survey information to satisfy this class the following shall be met:

- Depth data shall be collected from a minimum of 20 percent of the seabed in the navigable waterway. Spacing of sounding lines shall meet this requirement and may be of closer spacing in areas where siltation is known to occur. However the area coverage shall be negotiated between the authority that declares the depth available for navigation and the supplier.
- The resultant reduced depths shall have a vertical uncertainty equal to or better than the survey uncertainty component of the port's UKC model.

In all other respects the data emanating from a Class B survey is to meet appropriate requirements for Order 1a surveys in IHO Publication S-44.

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**REQUIREMENTS TO ACHIEVE CLASS A OR CLASS B SURVEY**

**Introduction**

The purpose of this document is to provide the users, and the supplier of the hydrographic information, in Australian ports with a checklist for evaluating the quality of the information provided and for use in the initial planning of a survey. It does not provide detailed technical aspects, it does however set out what points must be addressed for a survey to be classed A or B. The technical aspects that are to be included in the Method Statement are the responsibility of the professional hydrographic surveyor. This Appendix would also be useful as a guide in the preparation of a detailed technical specification for inclusion in contract documents.

The user of this Appendix would have a strong working knowledge of hydrographic surveying or have access to professional advice in this matter. Section 3 of this Appendix (Method Statement) is critical in demonstrating that the required standard can be achieved. As such the Method Statement is to clearly state how the requirements detailed in this Appendix shall be met.

Hydrographic surveying relies on information from a number of sensors and is a form of remote sensing. As such the surveyor must ensure that equipment is kept in calibration and demonstrate that it meets the accuracy requirements of the survey.

**1 PERSONNEL**

- 1.1** The hydrographic surveyor responsible for the hydrographic information as described in Clause 1 of these Principles will be a suitably qualified and experienced or preferably a currently Certified Professional (Hydrographic Surveying Level 1) as determined by the Australasian Hydrographic Surveyors Certification Panel of the Surveying and Spatial Sciences Institute of Australia, and should be able to demonstrate a proven ability to undertake his/her work. (Refer to List of Current Certified Professionals in Hydrographic Surveying:  
<http://www.sssi.org.au/details/commission/4/cat/425.html>)
- 1.2** It is the responsibility of this person to ensure the quality of any information or data supplied by third parties that is used in compiling the resulting information.
- 1.3** Suitable training and documented job instructions shall be provided where persons other than the above hydrographic surveyor carry out tasks that are critical to the resultant accuracy of the survey.

## **2 HORIZONTAL AND VERTICAL DATUMS**

- 2.1** The survey shall be traceable to the Australian National Network (ANN) and its relationship to the Geocentric Datum of Australia 94 (GDA 94) defined.
- 2.2** The survey shall be connected to the port's 'standard port' bench mark. Soundings should be reduced to port datum. The relationship to the ellipsoid height should also be ascertained for the standard port bench mark and any other tidal stations used for the reduction of soundings.

## **3 METHOD STATEMENT**

The hydrographic surveyor will produce a Method Statement for each type and class of survey carried out within the port. The Method Statement is to clearly set out the personnel, equipment, calibration methods and frequency, processes used in reduction to sounding datum and the method of classification of results.

Where calibration or testing of equipment is carried out other than during the course of the survey, the method statement shall refer to these calibrations. Calibrations of this nature shall be fully documented and archived.

The Method Statement shall as a minimum address the following points:

### **3.1 Horizontal Positioning**

- 3.1.1** Horizontal datum to be employed and control points to connect survey to horizontal datum.
- 3.1.2** The method or methods of obtaining horizontal position.
- 3.1.3** Calibration methods and frequency.
- 3.1.4** Process to be employed for dynamic calibration of survey system.
- 3.1.5** Rejection criteria for horizontal position data.

### **3.2 Vertical Datum**

- 3.2.1** The method of measuring tidal heights for the duration of the survey and throughout the survey area.

### **3.3 Depth Measurement**

**3.3.1** The method or methods used to determine depths, particularly the least depths in the navigable waterway, shall be clearly stated. Where necessary the manufacturer's specifications shall be attached or referred to.

- 3.3.2 Echo sounder frequency(s).
- 3.3.3 Method and frequency of calibration, including all associated equipment.
- 3.3.4 Method used to negate or compensate for transducer motion (heave).
- 3.3.5 Limiting sea conditions that would affect the quality of the survey.
- 3.3.6 Settlement/squat of transducers at survey vessel's sounding speed.

### **3.4 Seabed coverage**

- 3.4.1 The expected coverage from the methods described in Section 3.3.
- 3.4.2 The echo sounder's pulse repetition rate at anticipated survey depth/s.
- 3.4.3 Beam widths – along track and across travel.
- 3.4.4 Survey vessel's speed over ground.
- 3.4.5 Sounding line spacing and direction/s.
- 3.4.6 Process to be used for sounding berth and channel limits (i.e. toe lines, berth faces).

### **3.5 Sounding reduction and data presentation**

- 3.5.1 The methods used to reduce raw data to sounding datum.
- 3.5.2 Principle and method used in sounding selection.
- 3.5.3 Principle and process for rounding of selected soundings.
- 3.5.4 Positioning of selected soundings.
- 3.5.5 Method of contour generation.
- 3.5.6 Scale of plans.
- 3.5.7 Digital format of final data.

### **3.6 Data quality and retention**

- 3.6.1 The method(s) used to determine the quality of the data and ability to meet the survey error tolerance as required in Clauses 4.1.2 and 4.2.2 of the Principles.
- 3.6.2 The time frame/s and those responsible for retention of raw data gathered during the survey and the final results.

## **4 SURVEY REPORT**

Where the survey data needs to be rendered to the Australian Hydrographic Office to ensure that the official navigational chart reflects the port declared depth, and remains current it is to be accompanied by form AH 68(A) – Report Summary for supplying data to the Australian Hydrographic Office or a report containing the equivalent metadata

## **5 SURVEY PLAN**

The minimum metadata to be included on the Survey Plan is:

- 5.1** Class of Survey.
  - 5.2** Horizontal Datum and its definition.
  - 5.3** Total Horizontal Uncertainty.
  - 5.4** Vertical datum/s and their definition.
  - 5.5** Total Vertical Uncertainty.
  - 5.6** Dates of Survey.
  - 5.7** Name of Surveyor responsible for survey, and his/her signature.
  - 5.8** Scale of Plan.
  - 5.9** Survey system utilised (Echo-sounder, Heave Compensator /Motion Reference Unit, Horizontal Positioning System, Data Collection/Processing System, Tidal Information).
  - 5.10** Gazetted depths.
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