

REGISTERING AND RATING METADATA AT RIJKSWATERSTAAT

A New Quality Management System

A great deal of metadata is registered during hydrographic survey. This data (information on survey conditions, online and offline filter settings and calibrations) is essential for assessment of the quality of the hydrographic dataset and to trace its history later in the process. The Dutch Directorate of Public Works and Water Management Rijkswaterstaat has developed a Quality Management System (QMS) to register metadata. The QMS will allow a user to correctly rate the acquired dataset.

The following scenario might sound familiar to people working with hydrographic datasets: comparing two collected datasets, a data processor calculates volume difference between them. He finds a large and unexplainable discrepancy between the sets. He begins comparing the hand-written logbooks of the two surveys but can't find any disturbing differences. Has everything been properly recorded in both logbooks? The next step may be to compare all the settings between the two datasets. This, of course, is a very time-consuming process.

Changing Trends

Like many other hydrographic organisations, Rijkswaterstaat is nowadays using advanced hydrographic systems. For several years now RTK GPS, multi-beam echo sounder and advanced motion sensors have become standard systems used in surveys. The introduction of these systems is the cause of breaks in trend. It becomes very important too, for instance, to know which dataset has used tide correction and which has been collected using RTK GPS. In modern systems a large number of parameters can be set and should therefore be recorded as meta-information. Data management is now an important issue for hydrographic organisations. The general question is, how can I rate the value of the acquired dataset and does it fit the requirements of my purposes? Rijkswaterstaat established a working group to solve this key issue. Meta-information is a crucial requirement for the value of a dataset to be correctly rated. Besides a registration system for meta-information, a set of norms has also been developed (similar to IHO norms) to assess the quality of the measurements. For this the working group developed a so-called Quality Management System (QMS).

Dataset Norms

A client wants a dataset acquired for a product specification with accuracy based on a given norm, for instance as given by the International Hydrographic Organization. The definition of the special IHO order is "specific critical areas with minimum underkeel clearance and where bottom characteristics are potentially hazardous to vessels" (generally less than 40m). In The Netherlands most channels are less than 40m deep, so we designed a specific version of the special orders. We have distinguished between single-beam and multi-beam surveys. In total, we have three special orders for single-beam surveys and four special orders for multi-beam surveys; all are area-dependent. To calculate the accuracy we used the same formula as the IHO, meaning there is a depth-independent error (A) and a depth-dependent error (B). Factor C can be added to the formula in case a client has other needs.

QMS Framework

The first stage in developing a quality system is to identify the necessary steps in the hydrographic process; we identified the following: formulating the needs of the client

- preparation for the survey
 - collecting data
 - processing data
 - transforming data into an information product.
- These processes are discussed individually in the following sections.

Client Needs

Rijkswaterstaat developed an application for the formulation of survey orders. This tool is based on a question-and-answer principle and is used to obtain a well-formulated assignment. The application translates the information need of the client into the specifications of the survey product. The results are stored in the QMS database using eXtensible Markup Language (XML).

Preparing Survey

Once the product specifications are clear, a start can be made on preparation for the survey; questions that need to be addressed are:

- which vessel to choose

- which hydrographic sensors to choose
- what is the status of the systems and do they need a manufacturer check
- what is the status of the calibration values of the independent systems
- if all the independent systems are integrated, what is the accuracy that can be theoretically achieved
- how does this theoretical value relate to product specification?

The Quality Management System combines all this important information in the QMS database. Since product specifications and theoretical accuracy are now known, the constraints can be determined for collecting the data. These can be calculated in the excel program MEET (Multi-beam Error and Evaluation tool).

Collecting Data

Before the surveyor starts collecting data, several checks need to be done to ensure the quality of the survey. Rijkswaterstaat has identified the following: position check, draught check, gyro check and comparison of RTK with a tide gauge. As well as these pre-survey checks, a surveyline needs to be run twice, and there must be monitoring of the RTK base-station during the survey. The results of these surveyor-executed checks are recorded by the survey system and exported (in XML) to the QMS database. This export-plugin records the information in XML format. During the survey not only the initial settings (i.e. online filters) are automatically recorded but every change in the settings in between as well. The same applies for validation of the survey.

The End Product

Beside the data itself, a chart of the survey is usually produced. For this we have developed a uniform legend, implemented by all Rijkswaterstaat departments. This does not imply that all legends are the same but that they contain the same information. The collected data and a subset of the meta-information will be stored in the database Water Data Infrastructure (WADI) Rijkswaterstaat, a collaborative effort to facilitate and enable access to data gathered as part of the water-related activities of Rijkswaterstaat. WADI is a follow up of DONAR.

DONAR to WADI

WADI centres round storage of and access to Rijkswaterstaat "wet" data. This covers a wide range of both operational and organisational needs, such as the condition and use of water systems and basins. At present, most of this data is stored in the current data storage systems of Rijkswaterstaat, DONAR. This system is now showing its age and has significant limitations, prompting the development of WADI, which is expected to lead towards a long-term data management solution. The functions of Rijkswaterstaat define the scope for the data in WADI, which is thus limited to data from measurements and derivations thereof with regard to national waters in so far as these are suitable and required for re-use. This includes, for example, measurements, results from models, key parameters and indicators. The associated metadata is essential for all data in terms of re-use and long-term preservation. For most types of data geographical coverage is a key aspect of this metadata, which typically describes either a point or a more complex-shaped geographical area. With respect to the "wet" aspect of the scope of WADI, the definition follows that of the management area of Rijkswaterstaat, which specifically includes riverbanks (often dry, i.e. not flooded). The WADI technology is Web-based, which means that the data can be accessed from everywhere via the internet. The main public portal to WADI data will be the website www.watermarkt.nl. WADI is expected to become operational in the first half of 2006.

Final Remarks

Developing the Quality Management System is a continuing process. It will not stop here. In 2005 all the regional survey departments of Rijkswaterstaat will implement the Quality Management System. This will mean that Rijkswaterstaat is equipped with a very helpful tool for rating hydrographic datasets. Many registrations are done automatically within the system, reducing the chance of errors and ensuring uniform description of meta-information across the whole organisation. In 2006 the Quality Management System will be implemented as a Rijkswaterstaat standard application.

<https://www.hydro-international.com/content/article/a-new-quality-management-system>
