

**APPENDIX 1-A RESPONSE TO TECHNICAL REQUIREMENTS
AND INTRODUCTION TO THE PROCUREMENT**

1. Introduction

Overview of Appendices A-F

Appendices 1 A-B describes the Customer's purpose of the procurement and specifies all needs and requirements the new nautical production system must fulfil.

All appendices to the Agreement shall form the basis for the Supplier's response to the specified requirements.

Appendix 1 consists of the following appendices:

Appendix 1-A Overview and response to technical requirements

Appendix 1-B System Requirements

2. Response to technical requirements

The supplier shall respond to all requirements in the appendices in accordance with the specified documentation requirements.

Submission regarding Appendix 1-A

Appendices 1-A contain information only and do not include any requirements to be addressed by the supplier. The supplier is encouraged to thoroughly review the information in these appendices before responding to the remaining appendices.

Submission regarding appendix 1-B System Requirements

The supplier shall respond to all requirements in the table of requirements irrespective of whether they are classified as mandatory ('must') or recommended ('should').

All requirements shall be answered using a code (A, B, or C) that best describes the level of compliance for each specific requirement.

A -The requirement is covered by the system's standard functionality.

B – The functionality is currently under development and will be delivered in the next version of the system.

C – The functionality is not available, and there are no plans to develop it.

Requirements marked with an asterisk (*) require additional elaboration.

For these requirements, the supplier shall provide a separate description below the table, explaining:

- how the requirement is fulfilled in the existing solution, or
- how the requirement is planned to be fulfilled in a future solution (if not currently supported).

The description shall include relevant details on functionality, approach, and any dependencies or limitations, sufficient for the customer to assess the level of compliance and maturity of the proposed solution. The description may include supporting materials such as screenshots from user manuals or system documentation, or other relevant references that help demonstrate how the requirement is fulfilled.

Each description must clearly reference the relevant requirement ID.

3. General

The supplier is responsible for ensuring that the proposed solution meets the overall needs, even if those needs are not exhaustively specified through concrete requirements in the attached requirement tables. The requirements listed in the tables serve as a supplement to the overarching needs descriptions. Any failure to meet the overall needs must be clearly and explicitly stated as a reservation in accordance with the requirements set out in the tender documentation.

Suppliers are requested to complete the specification of requirements carefully and in accordance with the provided instructions, as failure to meet the requirements may result in rejection.

4. Introduction to the procurement

Preferred solution concept

NHS has a strategic need to establish a comprehensive and modern production system that will support the organization in achieving its goals of delivering nautical charts in accordance with new international standards. The system should also enable increased production capacity through efficient and quality-assured data management and production processes.

The new production system will consist of three main components:

1. **Software with advanced GIS functionality**, supporting the production of ENC's and paper charts.

2. **Data infrastructure for the storage and management of large datasets**, with a focus on security, accessibility, and scalability.
3. **Production management system**, providing overview and control of the entire production workflow, from data compilation and generalization to final product.

These components must be integrated into a seamless and efficient production pipeline that supports the creation of paper charts and ENC (Electronic Navigational Charts) in accordance with current and future standards. The system should also serve as a robust quality management tool, ensuring data integrity, traceability, and reliability throughout all stages.

The supplier's delivery shall include:

- A comprehensive nautical production system supporting the full lifecycle of ENC and paper chart production, including editing, validation, management, and publication of nautical products.
- Support for current and future international hydrographic standards, including S-57, S-101, S-52, S-58, S-158, INT1, and INT2, ensuring compliance and future readiness.
- Integrated data management and database capabilities, including support for open data formats, traceability, version control, and interoperability with external GIS and enterprise systems.
- Tools for quality assurance, validation, and workflow management, enabling efficient collaboration, production monitoring, audit trails, and controlled publishing processes for ENC and paper chart products.

Optional Module – Process Control and Workflow Management

The customer may choose to acquire an optional module for process control and workflow management. The **module** should provide support for planning, monitoring, and managing production. Desired functionality includes a consolidated overview of tasks and updates, the ability to assign priorities and deadlines, allocate resources, track progress, and monitor workflow status throughout the production process.

The solution should be configurable by the customer and support adaptation of workflows, task types, roles, and reporting structures to meet evolving operational requirements. The purpose of this option is to improve production overview, increase efficiency, and support a more structured and transparent management of production activities.

The customer reserves the right to acquire the optional process control and workflow management module at any time during the term of the agreement, should a need for enhanced workflow management capabilities be identified.

For further specification of system requirements, please refer to the attached documentation.

Background and rationale

With the growing volume and quality of collected data, and the goal "of sharing more data to more users faster", NHS (Norwegian Hydrographic Service) have established a project called "Nautilus". With Nautilus, NHS aims at establishing a fast and generic data value stream from data collection to usage, improving data quality, reducing time to users, and supporting automation, machine learning (ML), and artificial intelligence (AI) wherever possible".

The evolving role of NHS, today and in the future, is shifting from a tradition nautical data producer to an efficient data warehouse, while continuing to provide high-quality and authoritative nautical products.

To ensure proper alignment, focus and capabilities, the Nautilus project is aimed at providing answers and solutions that meet the new requirements.

The primary objective of the project is to increase production capacity and improve the management of nautical chart products. This is an initiative aimed at streamlining the production of nautical charts through a more seamless and modern production system.

The overall, long-term vision of the NHS is a data driven production flow, with clearly defined interfaces between the different parts of the production chain. With data driven production, we mean a production flow where updates to products are triggered by changes in (master) data.

5. Overarching principles and directives

The Norwegian Hydrographic Services' strategy

One of the strategic goals of the Norwegian Hydrographic Service (NHS) is to facilitate the collection, processing, and sharing of geographical information. The NHS is currently in the process of modernizing its geographical infrastructure to increase digitalization and ensure higher-quality collection and processing of geographical information, for both topographic maps and nautical charts.

This entails ensuring a reliable data foundation, compiling and utilizing data from various sources, and offering high-quality navigational charts and services that meet user needs.

The strategy for nautical charts is focused on ensuring safe and efficient maritime navigation by developing and updating high-quality nautical charts and other maritime information. This includes the use of new technologies, such as unmanned surface vessels (USVs), for conducting depth surveys, and making nautical chart data accessible to the public through a national geoportal and Primar.

S-100 standard

The introduction of the S-100 standard by the International Hydrographic Organization (IHO) represents a major step forward in nautical chart production. As a universal framework for hydrographic data, S-100 enables improved compatibility and interoperability across a wide range of maritime and geospatial products, forming the foundation for the next generation of Electronic Navigational Charts (ENCs). Within this framework, the S-101 product specification introduces new data models, functionalities, and production requirements that differ significantly from the current S-57 standard.

The introduction of S-101 presents significant challenges for hydrographic offices. The new standard requires production systems and workflows capable of supporting different data models, product specifications, and maintenance processes. For an extended period, both S-57 and S-101 products must be supported in parallel through a so-called “dual-fuel” production environment. This requires production systems that can efficiently create, maintain, and update both standards without significantly increasing operational complexity or workload. Ensuring a smooth transition while maintaining production capacity, data quality, and service delivery is therefore a key requirement.

NHS plans to put the new production system into operational use from approximately 1 August 2027. Prior to this, the focus will be on establishing and validating the production line for ENC and paper chart production, ensuring that workflows, processes, and system capabilities are ready for operational deployment. The goal is to achieve an efficient and well-managed implementation phase that minimizes disruption while enabling a smooth transition to the new production environment.