

MAINTENANCE OF THE NATIONAL GEODETIC INFRASTRUCTURE IN SWEDEN

Digital tools for planning and documentation of field work

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1. Background

Lantmäteriet is responsible for management and maintenance of the Swedish national reference systems and geodetic control networks on a national level. Maintenance includes inventory, surveying, establishing and replacement of geodetic control points. The required fieldwork takes careful planning, practical implementation, organized documentation and systematic follow-up. In recent years, the fieldwork process has been significantly revised and improved, leaving analogue paper-and-pen based methods for a digitalized and GIS-focused workflow aiming for more efficient management.



Figure 2: Sketches are updated in tablet application Procreate.

2. Objectives

The primary implementation of the new fieldwork process has been in the systematic inventory of height benchmarks in the national height reference frame RH 2000. Around 2000 height benchmarks are inspected every year to update their status, coordinates, descriptions and sketches. The aims have been:

- Reduce time of post-processing
- Improved field equipment
- Simplified access to statistics
- Better overview of work progress
- Easier planning



Figure 1: New digital workflow in three steps.
1. Preparing field control points by transferring them to a temporary database.
2. Field workers sync updates to the temporary database using Field Maps on a mobile device.
3. Reviewing updates, organizing data and transferring it back to the final database.

3. Setup

The new workflow is based on the ArcGIS platform, with a web-based GIS portal and the ESRI Field Maps mobile application. With a rugged tablet, the field worker gets access to a map with all control points to visit and information about them. Updates are synced directly to a shared database. The work can be carried out either online, or offline with sync when no internet connection is available.



Figure 3: The information about the control point is updated to the temporary database directly in field.

4. Conclusions

Although the increased use of technology introduces certain drawbacks, such as limited battery life and the potential for technical issues, the GIS- and tablet-based model has overall significantly improved the fieldwork process. Planning, execution, and follow-up are now integrated into a more efficient and seamless workflow.

Similar workflows have successfully been implemented for other types of fieldwork related to the maintenance of geodetic reference networks including the review of the national boundary between Sweden and Norway, relative gravity measurements and surveying of GNSS consolidation points.

Sketches are updated using a tablet pen in the Procreate drawing application and directly linked to the corresponding control point. Instant statistics are available through a web dashboard.

Since fieldwork progress status is always available in a web-based GIS, planning of upcoming fieldwork can be done seamlessly and in coordination with ongoing fieldwork. The shared database enables multiple users to work with the same dataset simultaneously without the risk of data conflicts. After the field season, all data updates are independently reviewed before being stored in the final database.



Figure 4: Statistics of ongoing fieldwork are available through a web dashboard.