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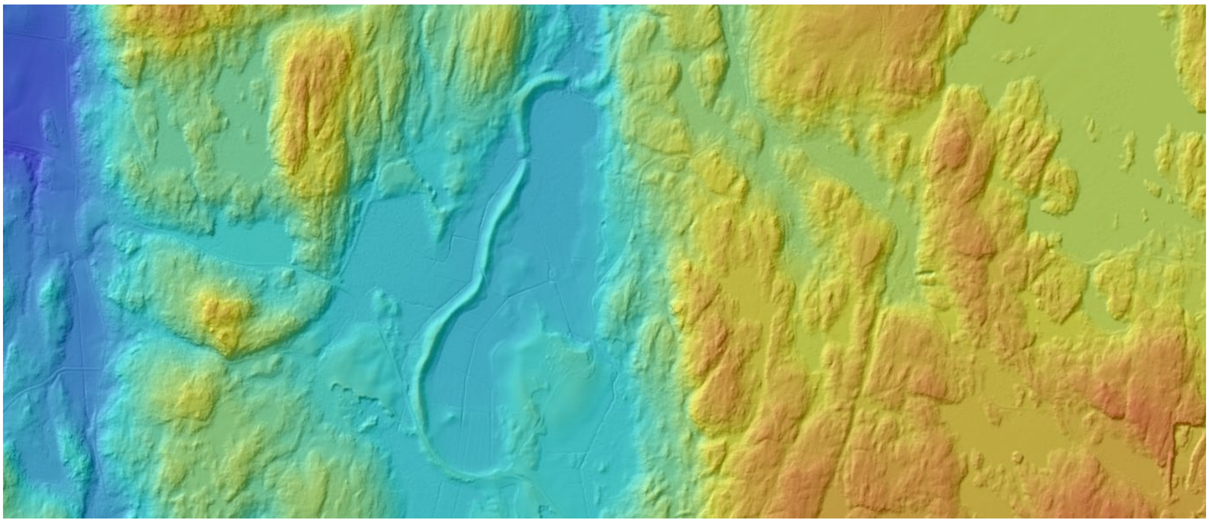
Product description:

GSD-Elevation data, Grid 2+



List of contents

1 General description

1.1 Contents

The product *Grid2+* consists of a terrain model in grid form with a resolution of 2 metres.

Elevation data is collected using aerial laser scanning and then processed. Based on the laser points which are classified as ground points a terrain model in the form of a grid, also known as a raster, is produced.

The product is delivered with metadata which details origin and processing history.

1.2 Geographic coverage

GSD-Elevation data, grid 2+ is nationwide.

The progress of the production is presented at the website Planer och utfall - Produktionsstatus (only available in Swedish). "Klart I lager" shows those areas that are ready for delivery to end-users.

1.3 Delivery tiles

The smallest unit for processing and delivery corresponds to a tile measuring 2.5 x 2.5 km geographically adjusted to the index system in SWEREF 99 TM.

1.4 Reference system

In plane: SWEREF 99 TM (can also be transformed and delivered in any regional SWEREF zone).

In height: RH 2000

2 Quality description

See the pdf-file *Quality description of National Elevation Model*, which can be found alongside this product description at the website Lantmäteriet - GSD-Höjddata, grid 2+.

2.1 Purpose and utility

The terrain model can be used in agriculture and forestry, emergency preparedness, planning, development, geology, archaeology and orienteering maps.

2.2 Data capture

A comprehensive terrain model in the form of a grid is created from laser points classified as ground and water. The calculation is done through linear interpolation in a TIN (Triangulated Irregular Network).

2.3 Maintenance

The terrain model is updated through aerial image matching and with laser data.

2.3.1 Maintenance frequency

Maintenance frequency follow the Lantmäteriet image provision program and plans for laser scanning. Data will be updated continuously.

The progress of the maintenance is presented at the website Planer och utfall - Produktionsstatus.

2.4 Metadata

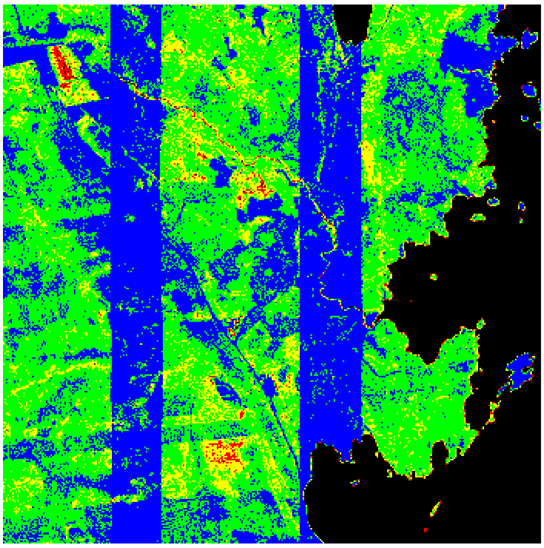
Metadata is supplied with the product as described below.

2.4.1 Description of image file

Every delivered grid file is accompanied by an image illustrating the degree of detail with which the terrain model can be expected to represent the ground surface.

The image has a resolution of 10 metres and shows the average point density of ground in laser data. The point density is illustrated with colours as per the table below.

Colour	Point density	Comment
Blue	> 0.5 points/m^2	On open areas and on side overlaps there might be more points on ground than the specified minimum requirement of 0.5 points/m^2.
Green	0.25-0.5 points/m^2	On average there is at least one point on ground within one grid cell (corresponding to 2 × 2 metres).
Yellow	0.0625-0.25 points/m^2	On average there is at least one point on ground within four grid cells (corresponding to 4 x 4 metres). The terrain model may have a diminished degree of detail in these areas.
Red	> 0.0625 points/m^2	On average there is less than one point on ground within four grid cells (corresponding to 4 x 4 metres). This might be caused by dense forest, steep slopes or water. The terrain model may have a significantly diminished degree of detail in these areas.
Black	0 points/m^2	Black colour in the image is due to either the water surfaces having been removed by masking or holes in the laser point cloud. Holes in the laser point cloud are due to poor reflection or dense vegetation, which may cause a total loss of points on ground. Poor reflection occurs on, for example, water, buildings with black roofs or new asphalt.



Example: The colours in the density image above represent varying point densities on ground in the laser data.

2.4.2 Description of the content in the metadata file

Every delivered grid file is accompanied by an metadata file (GeoJSON). The metadata file contains geometry and attributes as shown below.

The GeoJSON-schema is available here
http://namespace.lantmateriet.se/distribution/produkter/hojddata/v1/

Field	Description	Example
	Geometry, polygon The approximate area for the measurement session	
insamlingsdatum	Date for data capture	2010-04-02
ursprung	Origin	Lantmäteriet
matmetod	Survey techniqhue 1 Aerial laser scanning 4 Aerial photography, image matching	1
lagesosakerhetPlan	The approximate horizontal accuracy (metre)	0.3
lagesosakerhetHojd	The approximate vertical accuracy (metre)	0.1
klassificeringsniva	Classification level	3

3 Contents of the delivery

3.1 Folder structure at delivery

The terrain model and metadata are supplied as shown in the example below.

- hojddata
  - 67_5
    - 672_59_5050_2009.tfw
    - 672_59_5050_2009.tif
    - 672_59_5075_2009.tfw
    - 672_59_5075_2009.tif
    - 672_59_7550_2009.tfw
    - 672_59_7550_2009.tif
    - 672_59_7575_2009.tfw
    - 672_59_7575_2009.tif
    - metadata
      - 672_59_5050_2009.json
      - 672_59_5050_density_2009.tfw
      - 672_59_5050_density_2009.tif
      - 672_59_5075_2009.json
      - 672_59_5075_density_2009.tfw
      - 672_59_5075_density_2009.tif
      - 672_59_7550_2009.json
      - 672_59_7550_density_2009.tfw
      - 672_59_7550_density_2009.tif
      - 672_59_7575_2009.json
      - 672_59_7575_density_2009.tfw
      - 672_59_7575_density_2009.tif

3.2 Delivery format

Grid data is supplied in GeoTIFF-format (LZW-compressed).

Image file is supplied in tiff-format and metadata file in GeoJSON-format

3.3 Set of files and contents

File name (example)	Description
672_59_5050_2009.tif (LZW-compressed)	The file name includes the co-ordinates of the lower left corner of the tile and the year of data capture
672_59_5050_2009.json	Metadata presenting origin and level of processing, see description in section Metadata
672_59_5050_density_2009.tif	A raster file presenting the point density for those laser points that have been classified as ground, see description in section Metadata
672_59_5050_density_201809.tfw	Geo-referencing file for the image file above.

3.3.1 Coordinate-transformed grid

To reproject elevation data from SWEREF 99 TM to a regional SWEREF-zone the data will go through both a rotation of the raster and a resampling of the raster cells. An interpolation of the height values is necessary in order to adjust the elevation data to the regional SWEREF-zone grid. The method used is a bicubical interpolation method, as this method takes the surrounding terrain into account. Tests made at Lantmäteriet showed that the loss of quality in the resulting reprojected grid was negligible.

Files delivered in SWEREF 99 TM local zones are named with a zone prefix first in the file name, for example 1200_.