# LIDAR experiences - Preparing base maps using LIDAR data

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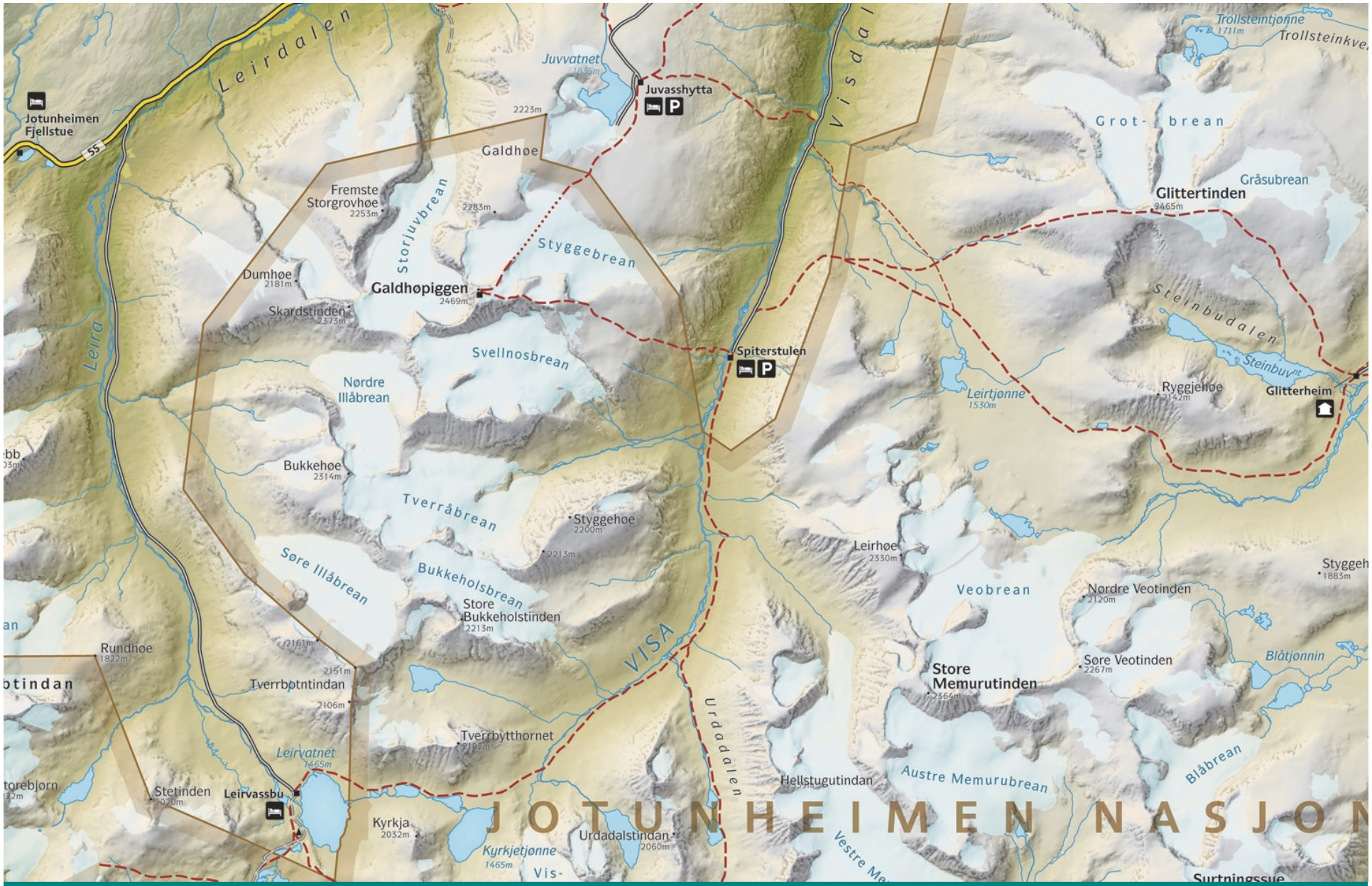
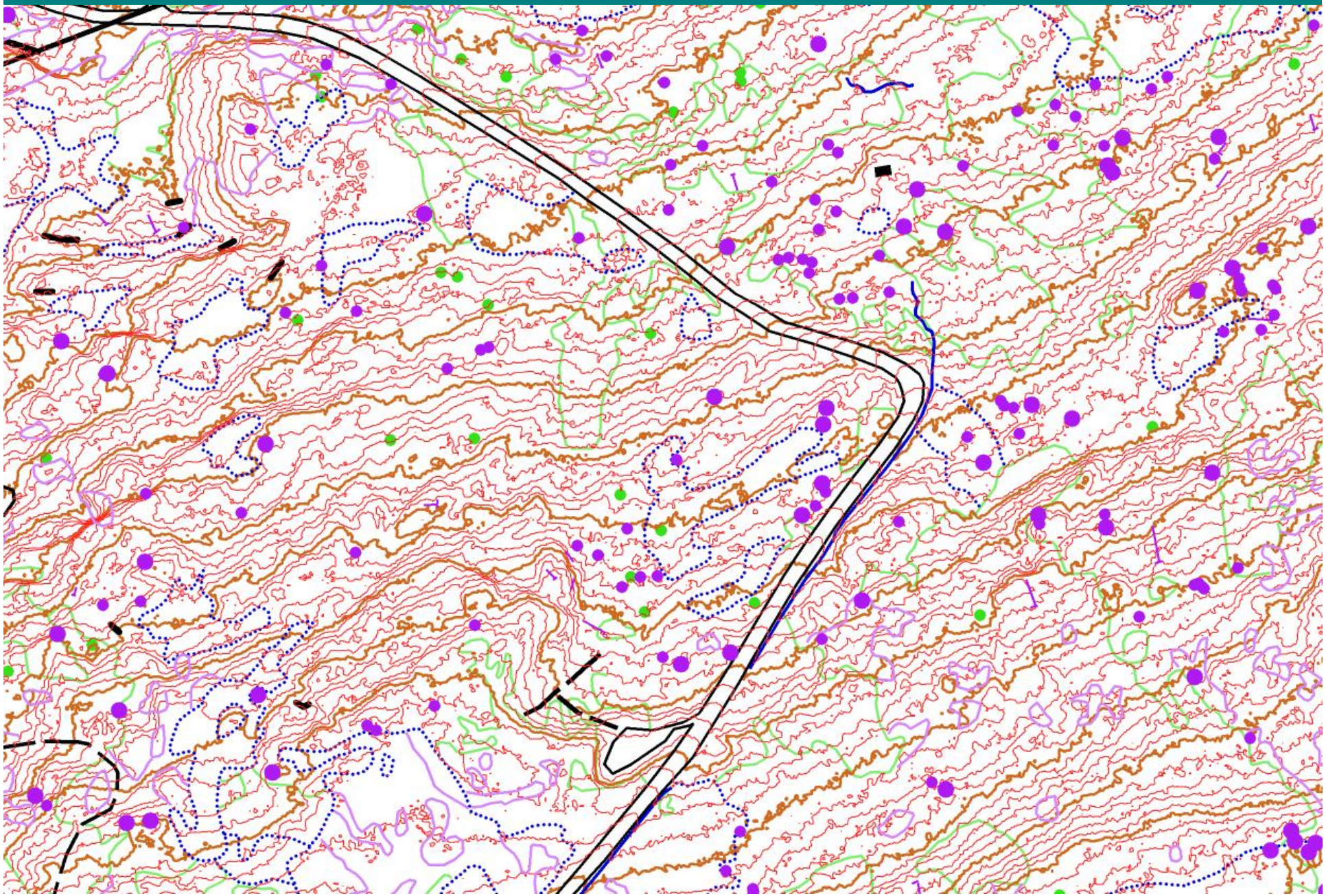



This is what I do in eMap (www.emap.no)

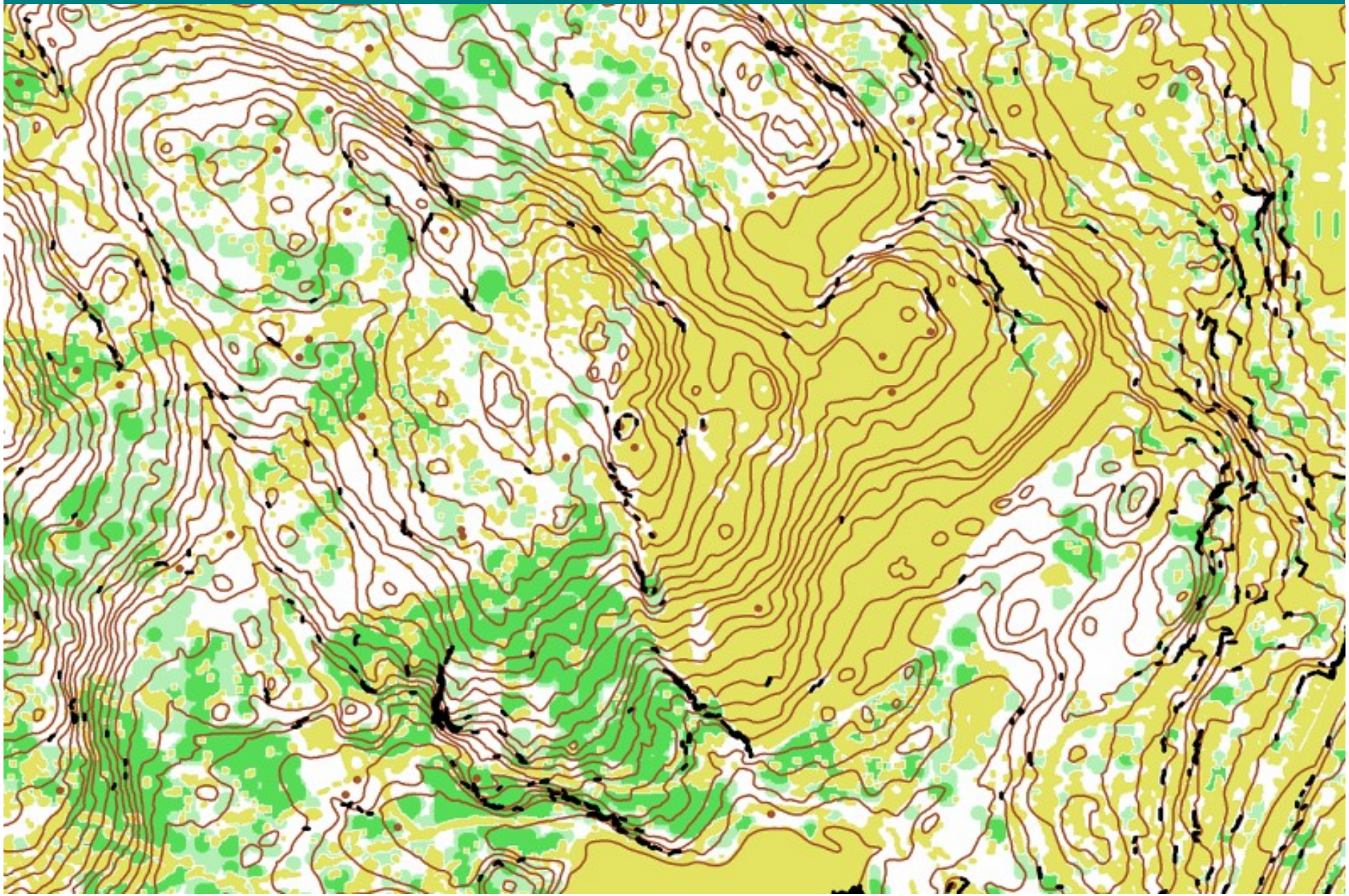
# Three approaches to base map generation

1. LIDAR contours + traditional photogrammetry
2. Automatic map generation
   - Karttapullautin
     - http://www.routegadget.net/karttapullautin/
   - Terje Mathiesen
     - http://tmsw.no/mapping/basemap_generation.html
3. **My approach (label welcome)**

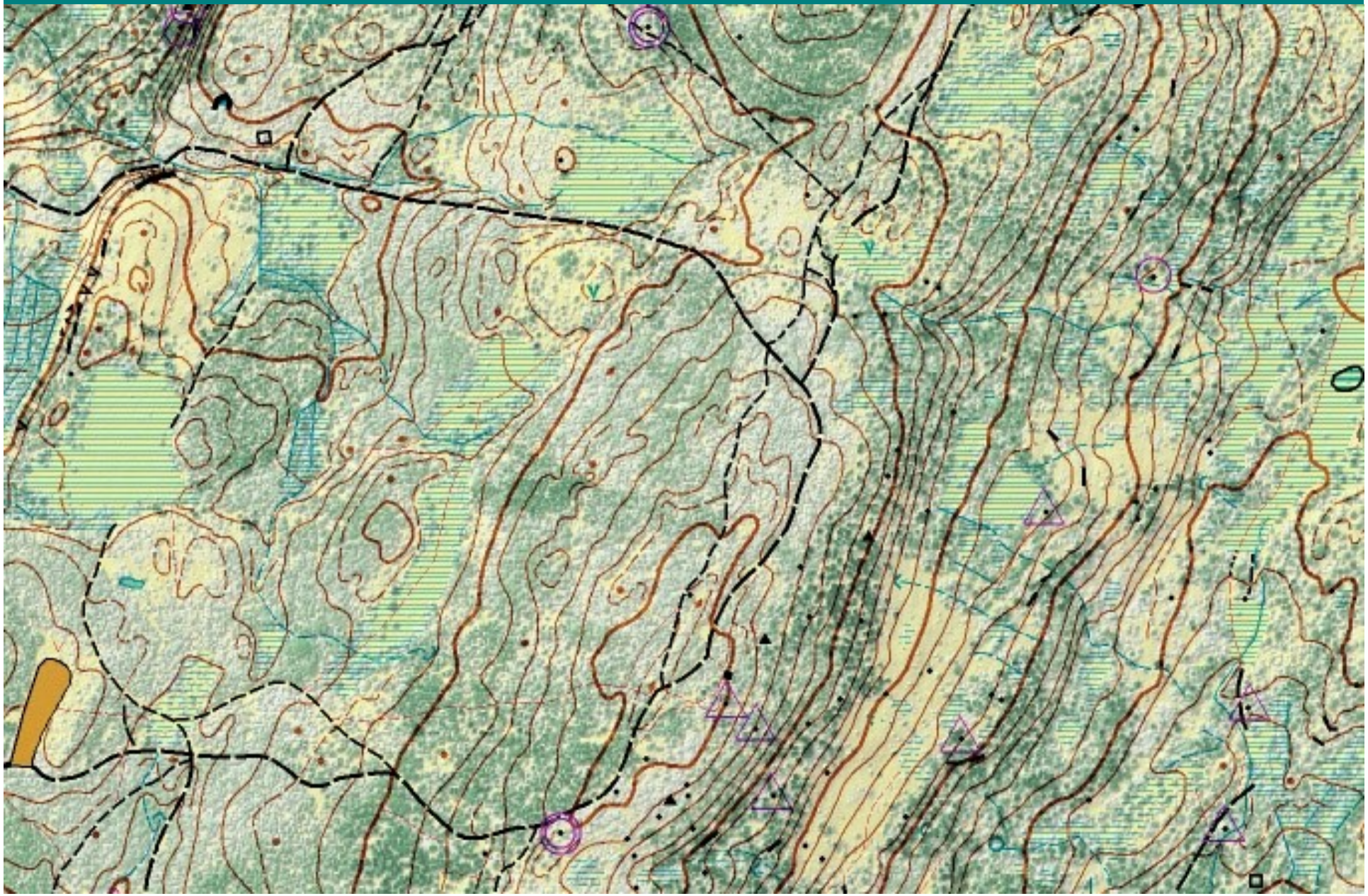
# Photogrammetry + LIDAR contours



# Automatic map generation



# My Approach



# General approach

- Prepare LIDAR data
- Create a preliminary map (home work)
  - Draw situation
  - Draw contours
  - Extract other information from LIDAR
  - Copy remaining features from older maps
- Field work
- Final cartography

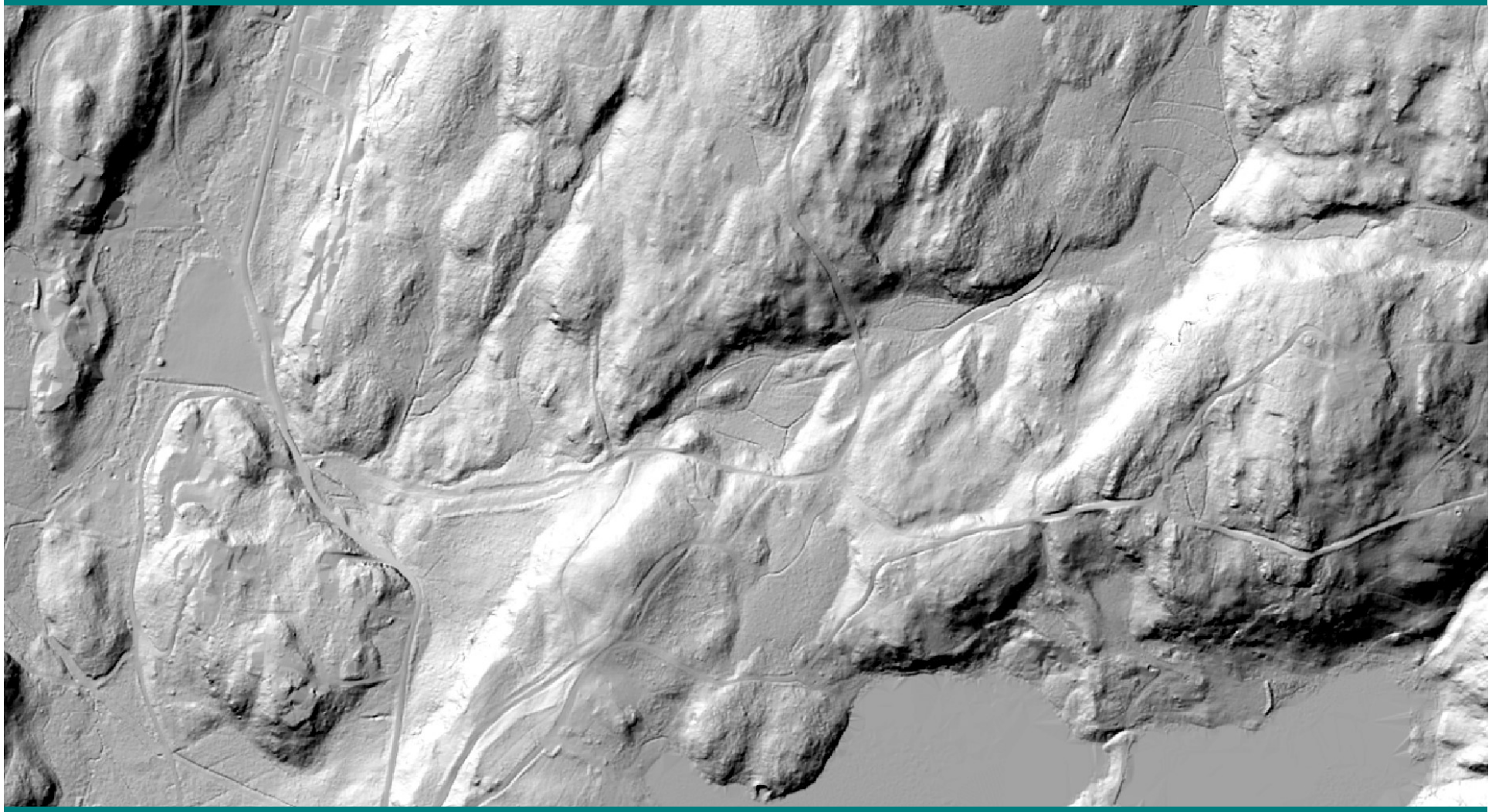
# Prepare LIDAR data

- If unclassified LIDAR, classify with
  - LASTools (Not completely free) rapidlasso.com/LAStools
  - MCC-Lidar (Free) sourceforge.net/projects/mcclidar/
- Create to 1m elevation rasters:
  - GND – ground elevation
  - TOP – surface elevation
  - INT – surface reflection intensity (not used)
- Models generated LAS-file by LAS-file and merged to single elevation models (QGIS/GDAL)

# Create vegetation height model

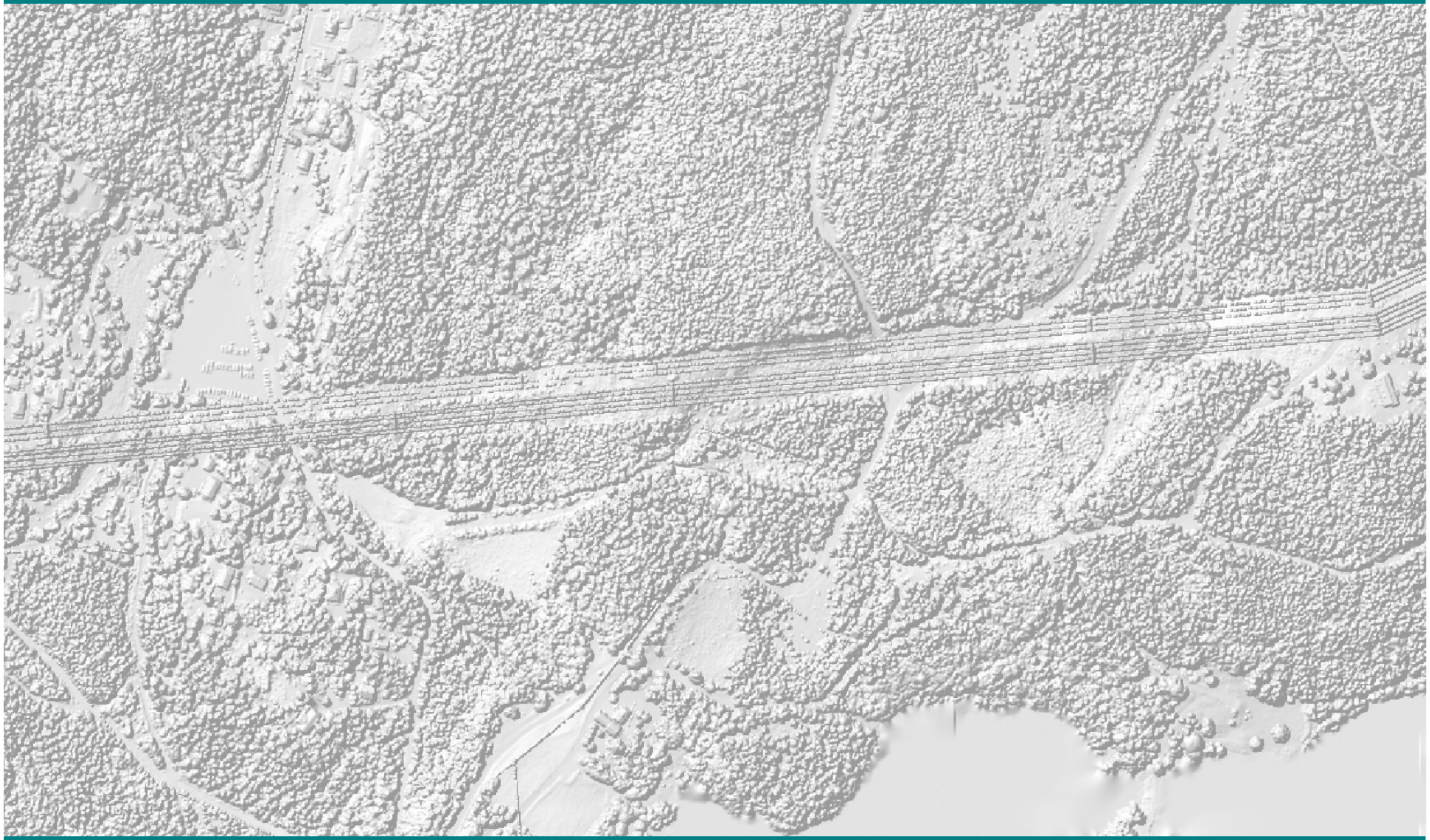
gdal_calc --outfile DIFF.tiff -A TOP.tif -B GND.tif --calc "A-B"

# Create hillshade of GND



gdaldem hillshade -of PNG GND.tif GNDSHADE.png

# Create hillshade of DIFF (or TOP)

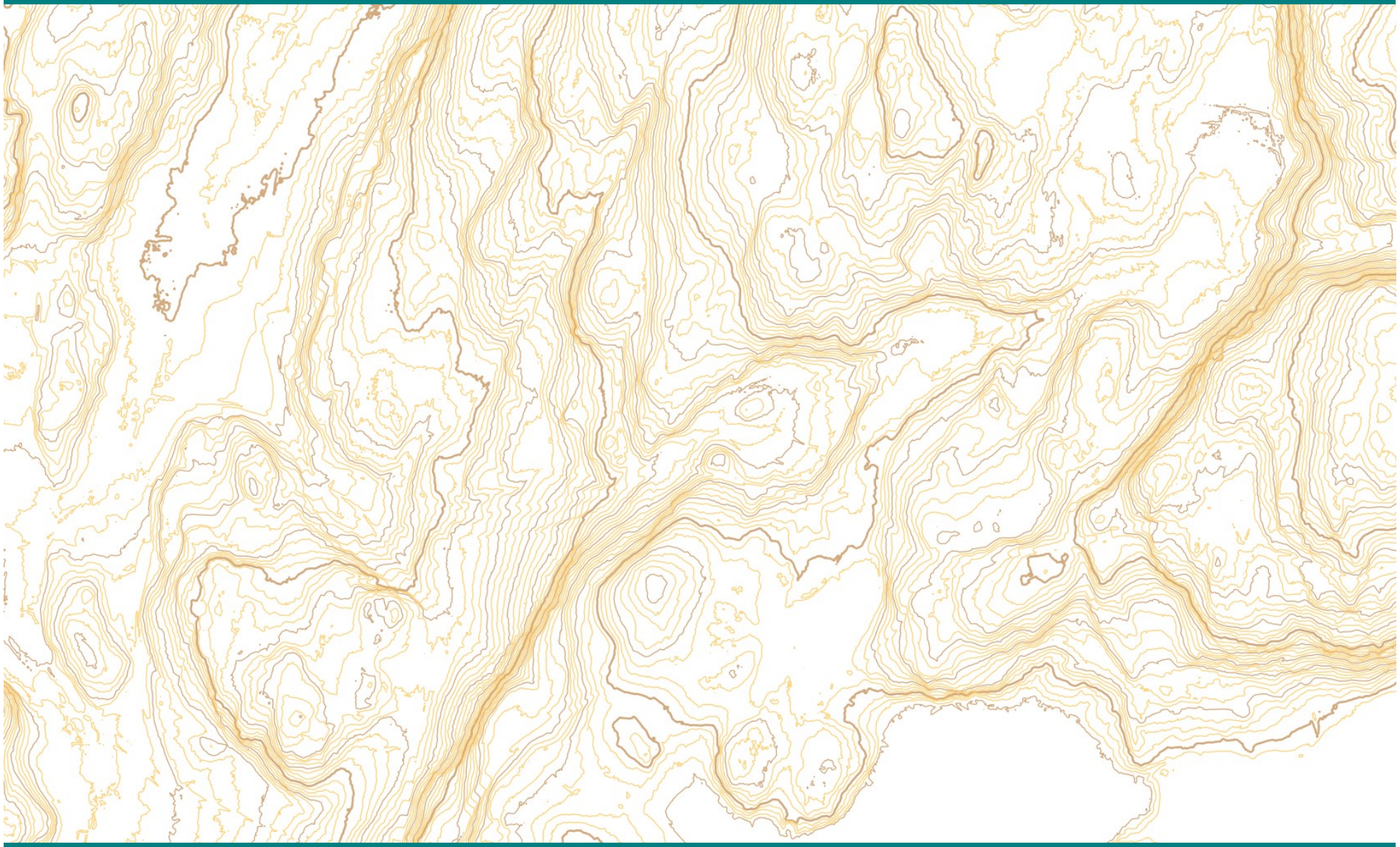


gdaldem hillshade -of PNG DIFF.tif DIFFSHADE.png

# Create slope model of GND

gdaldem hillshade –alt 90 -of PNG GND.tif SLOPE.png

# Create contours



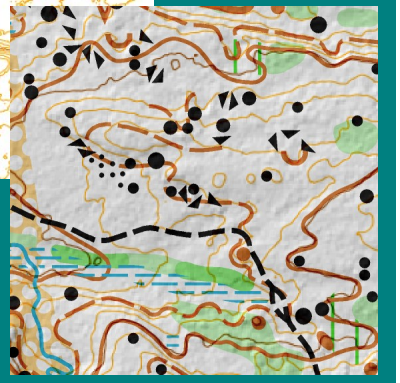
gdal_contour -a elev -int 1.25 GND.tif contours_125.shp

# Smooth or unsmoothed contours?

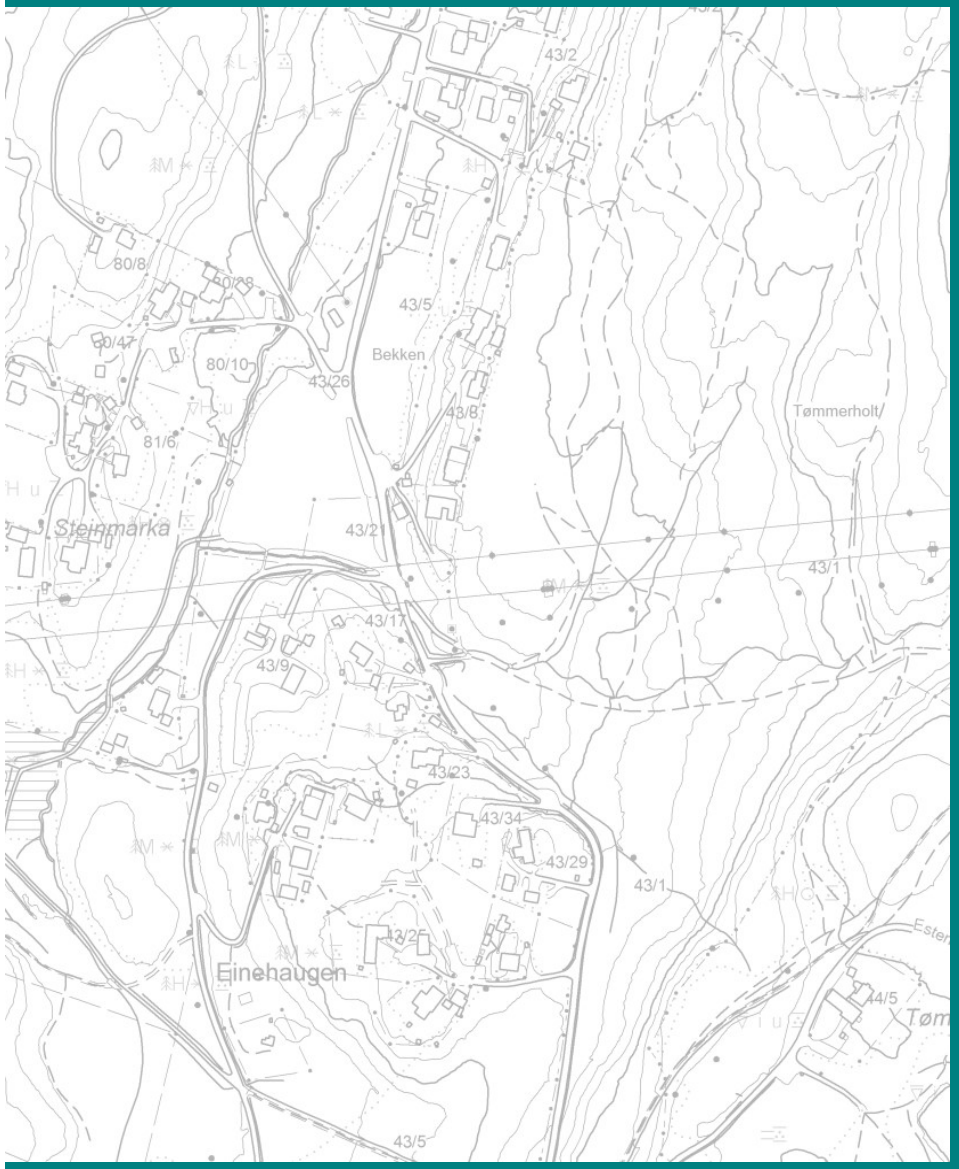
Some types of terrain seem to so rough that some sort of smoothing is necessary

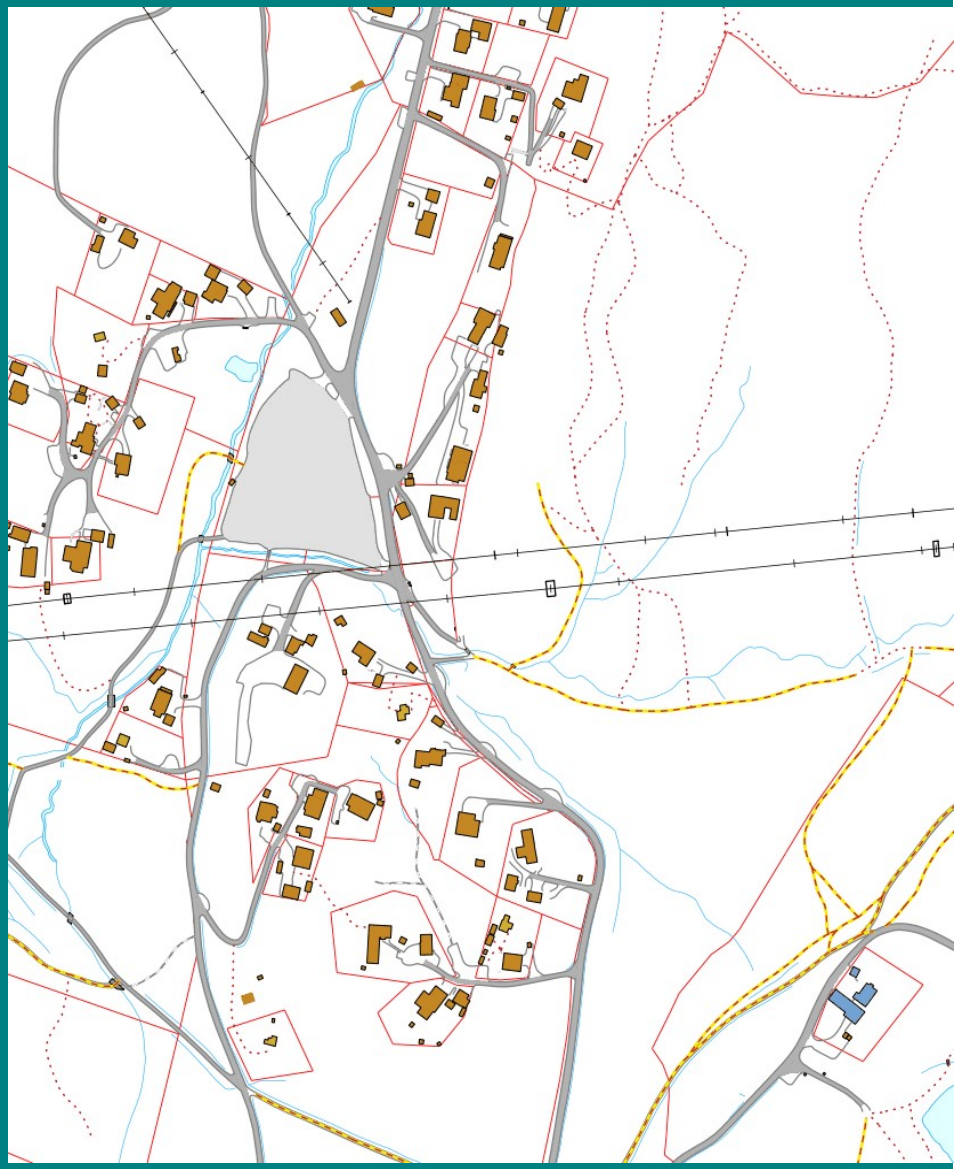
Elevation model smoothed before contour generation (FocalMean)

Seems that mappers do more mistakes with unsmoothed contours and no hillshade



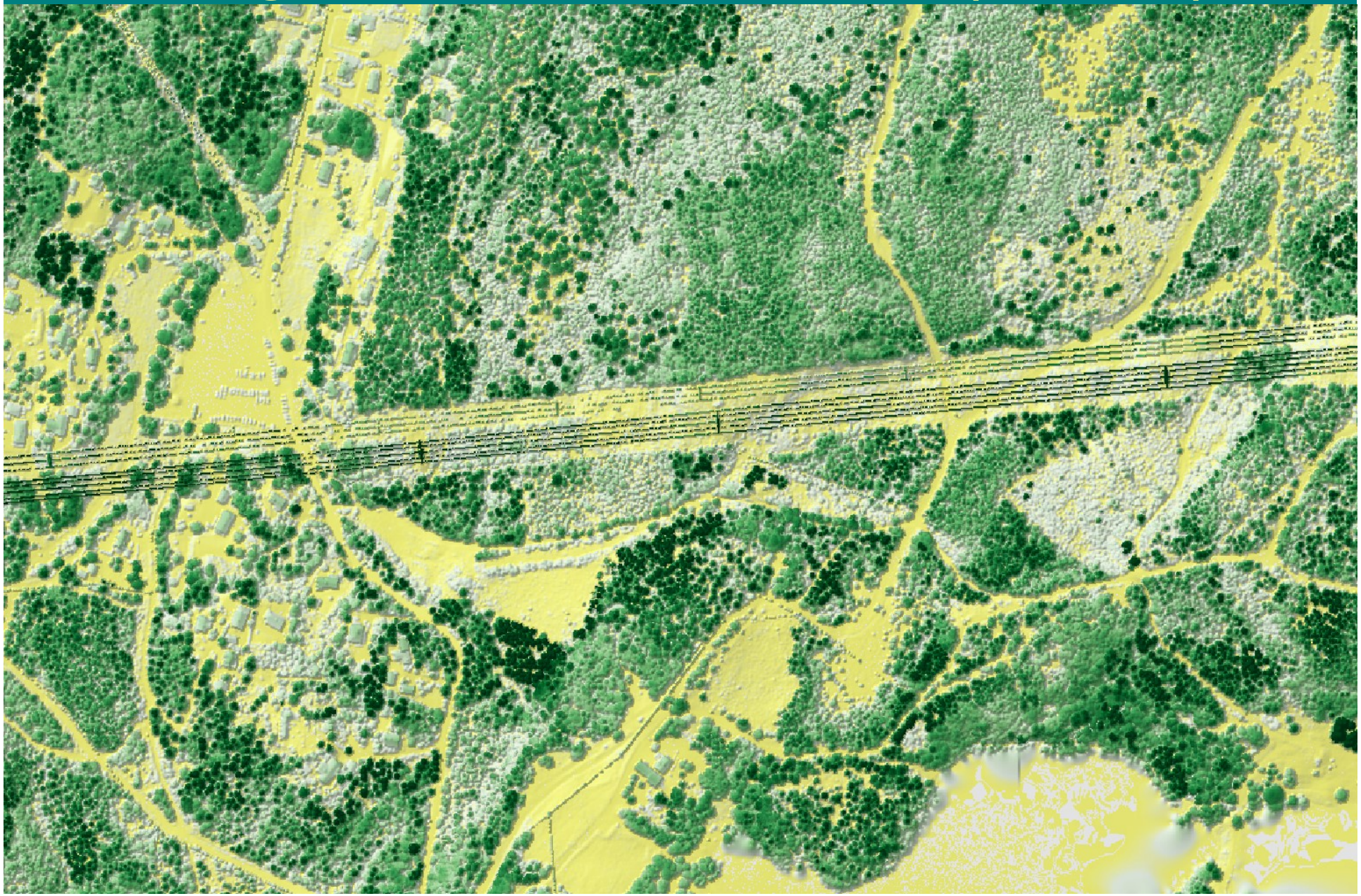
# Situation (WMS)



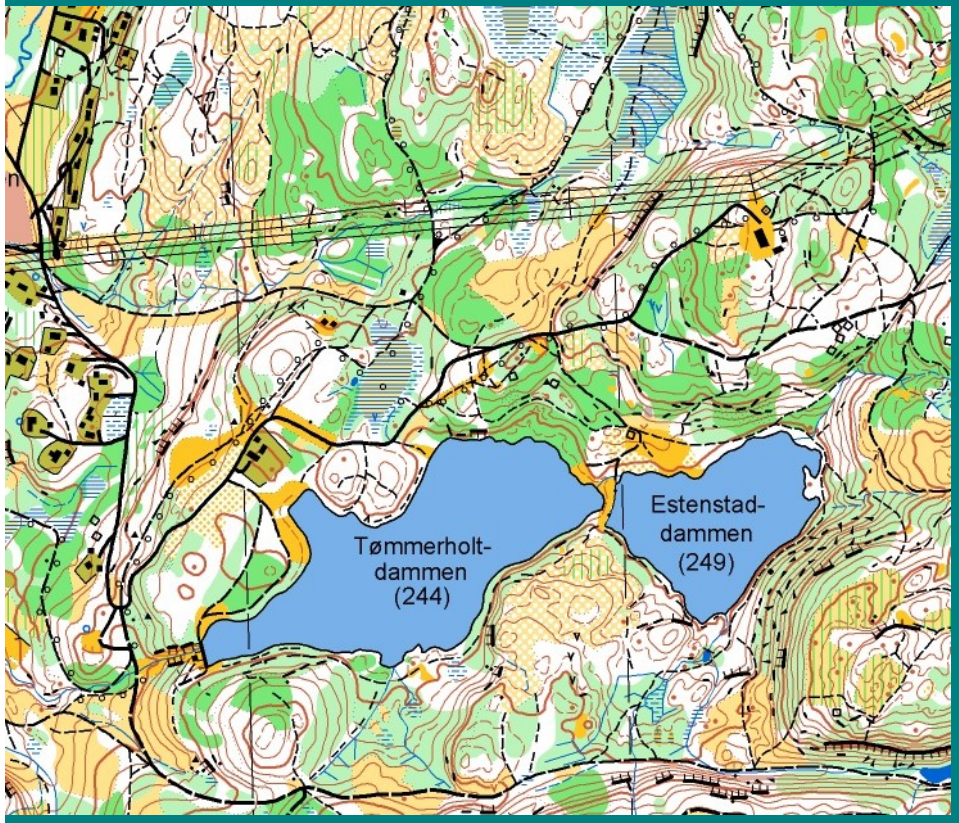



# Ground base map (QGIS)

# Vegetation base map (QGIS)



# Old map(s)



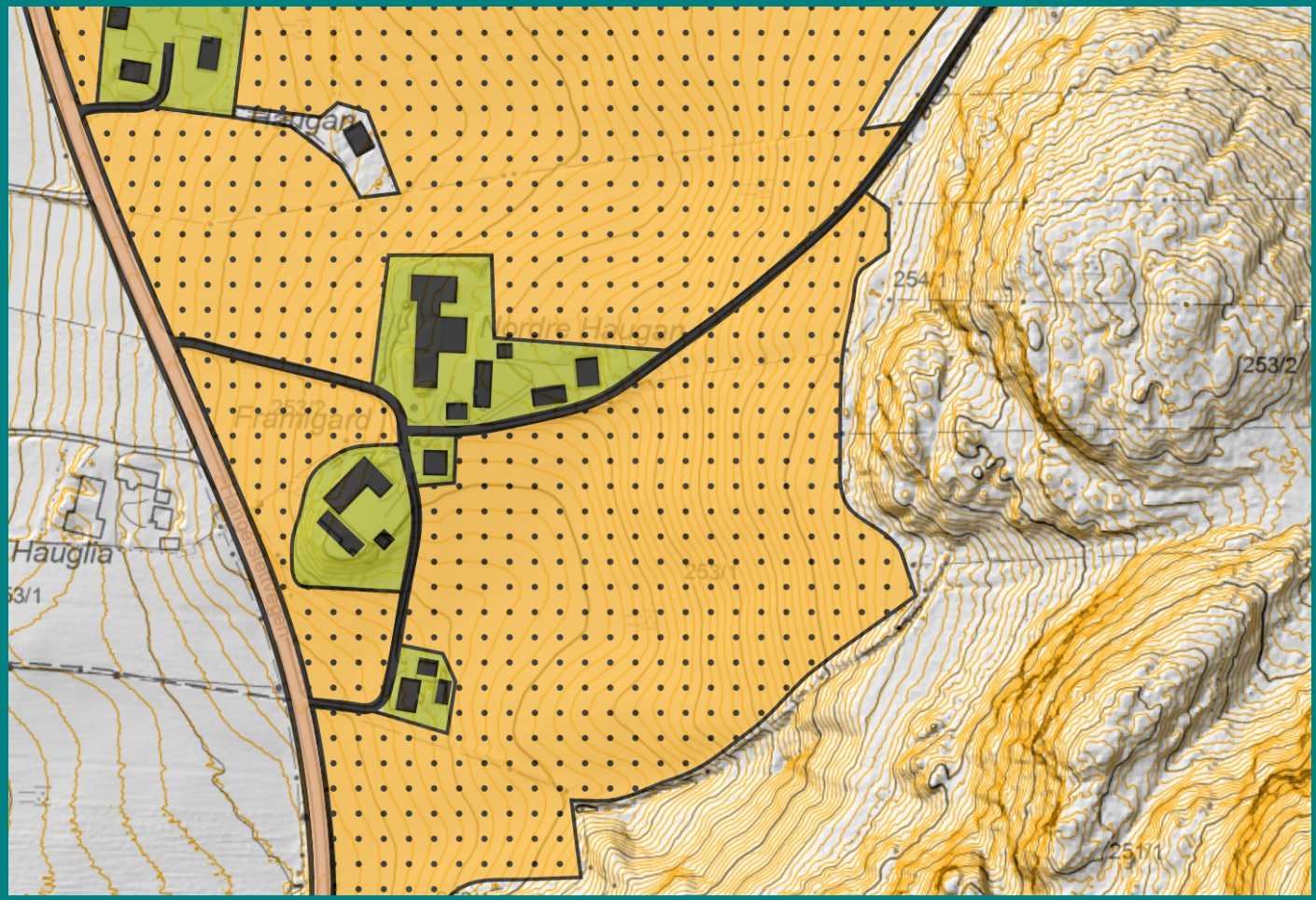

ca 1990


2010-2014

# Tablet / smart phone mapping

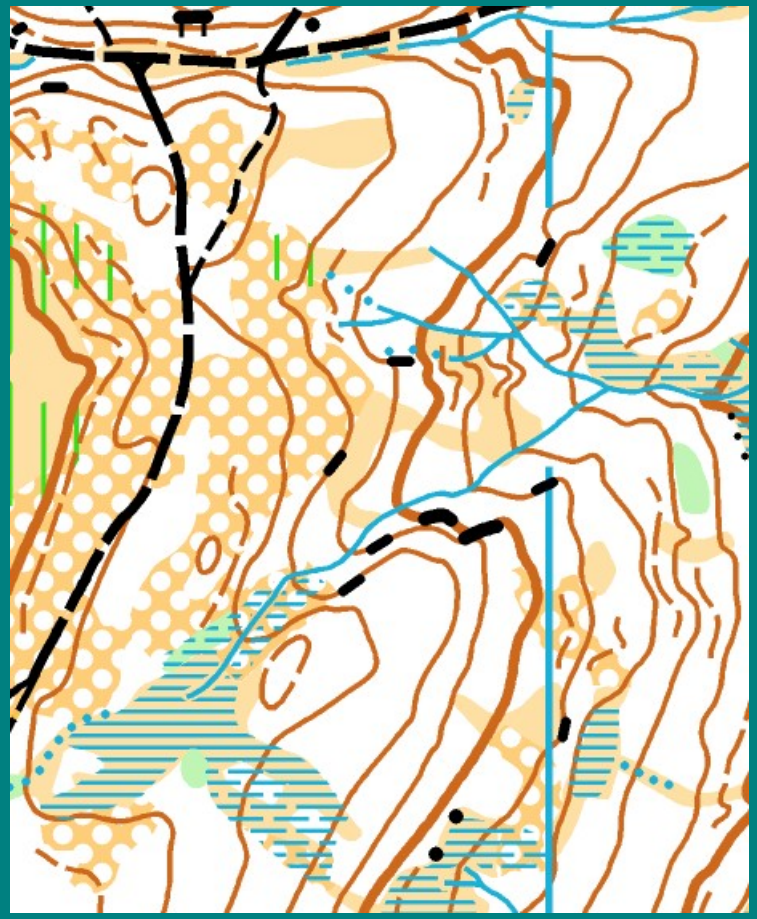
- If you have a digital device and can swap between background templates, you are ready to go.
- If not you, have some homework to do (possibly, this is just as fast anyway!)

# Draw buildings and roads

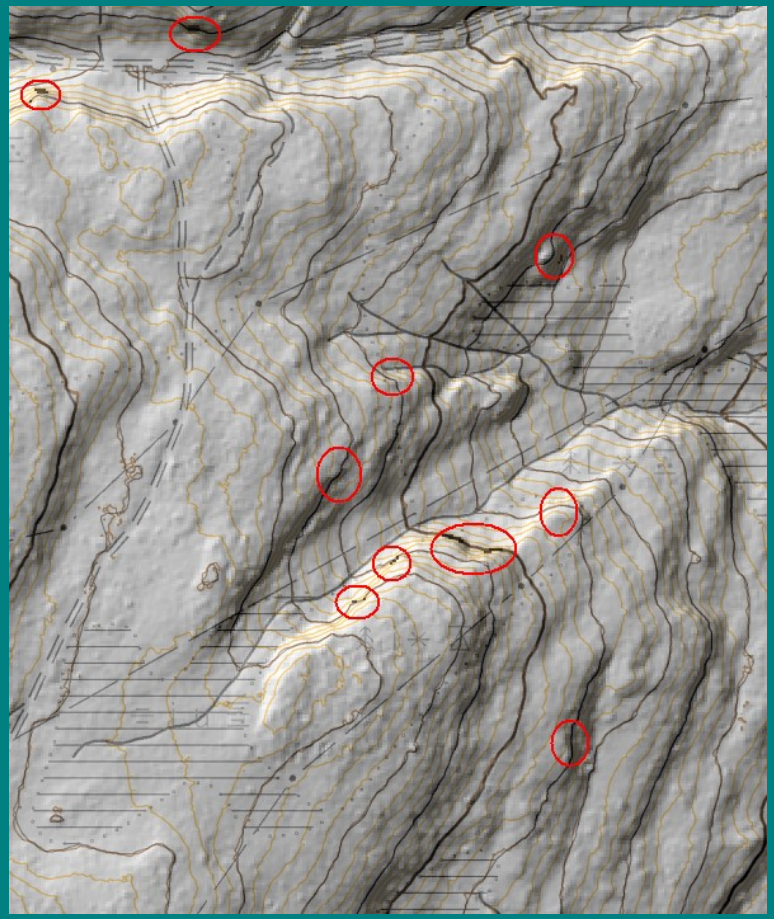



…and farmland and other things from public data sets

# Transfer crags and cliffs from old map



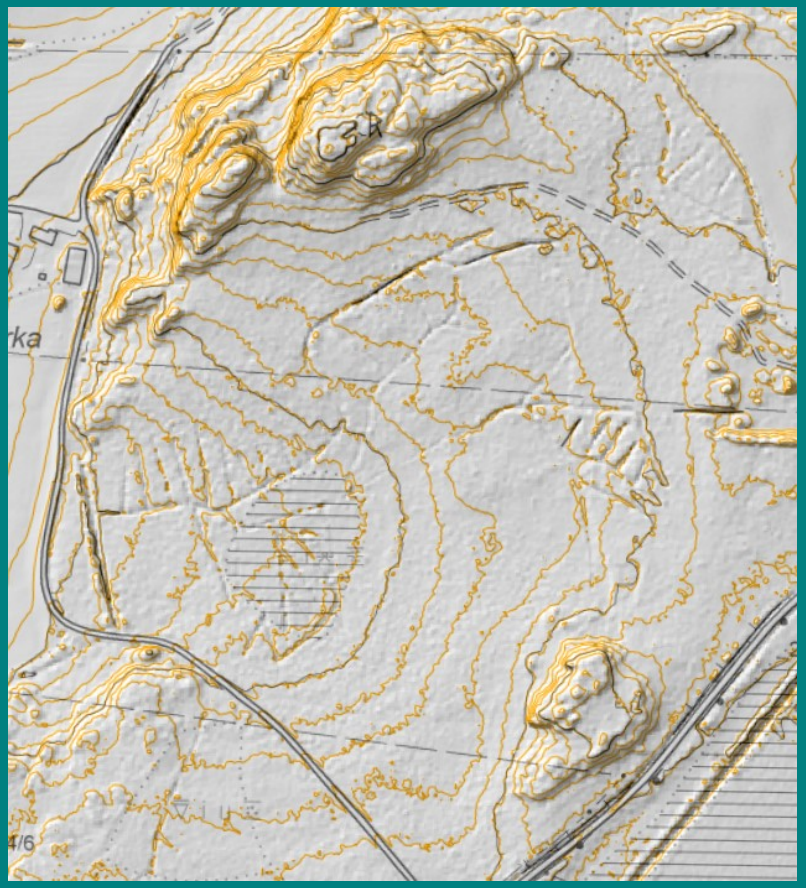
Old map



Base map

Allways draw these before contours

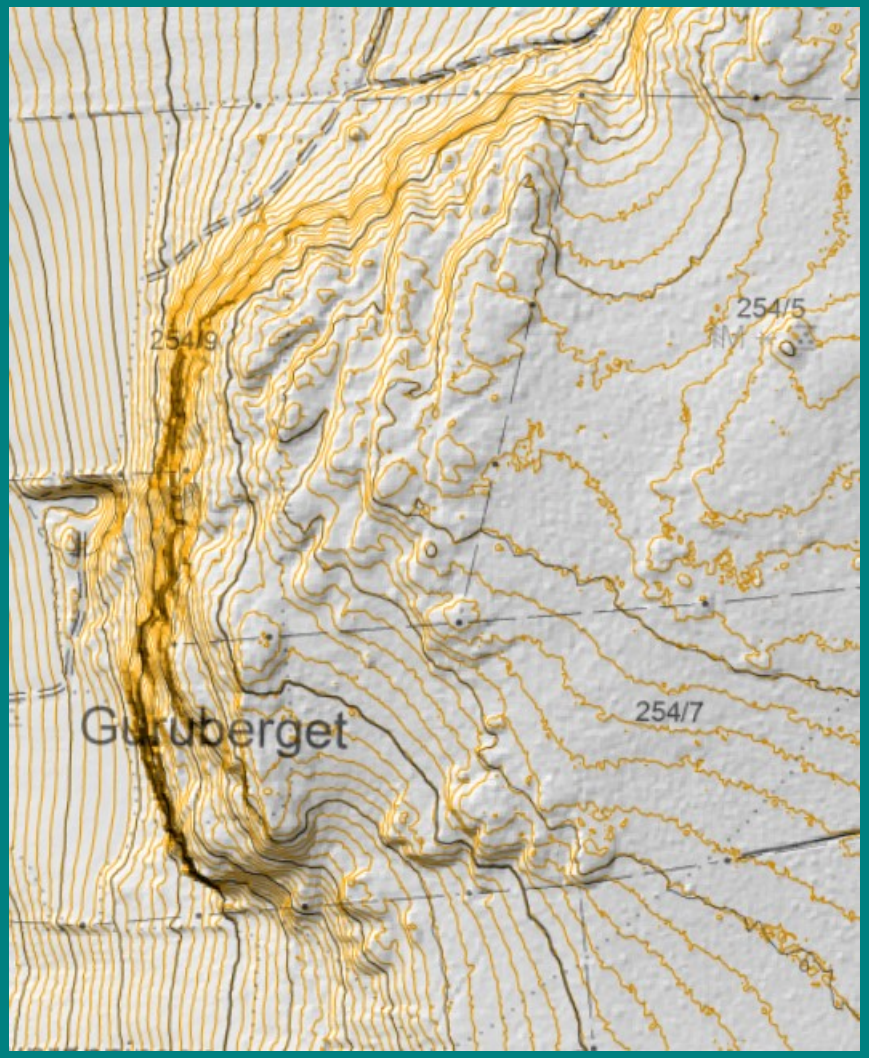
# Draw water courses

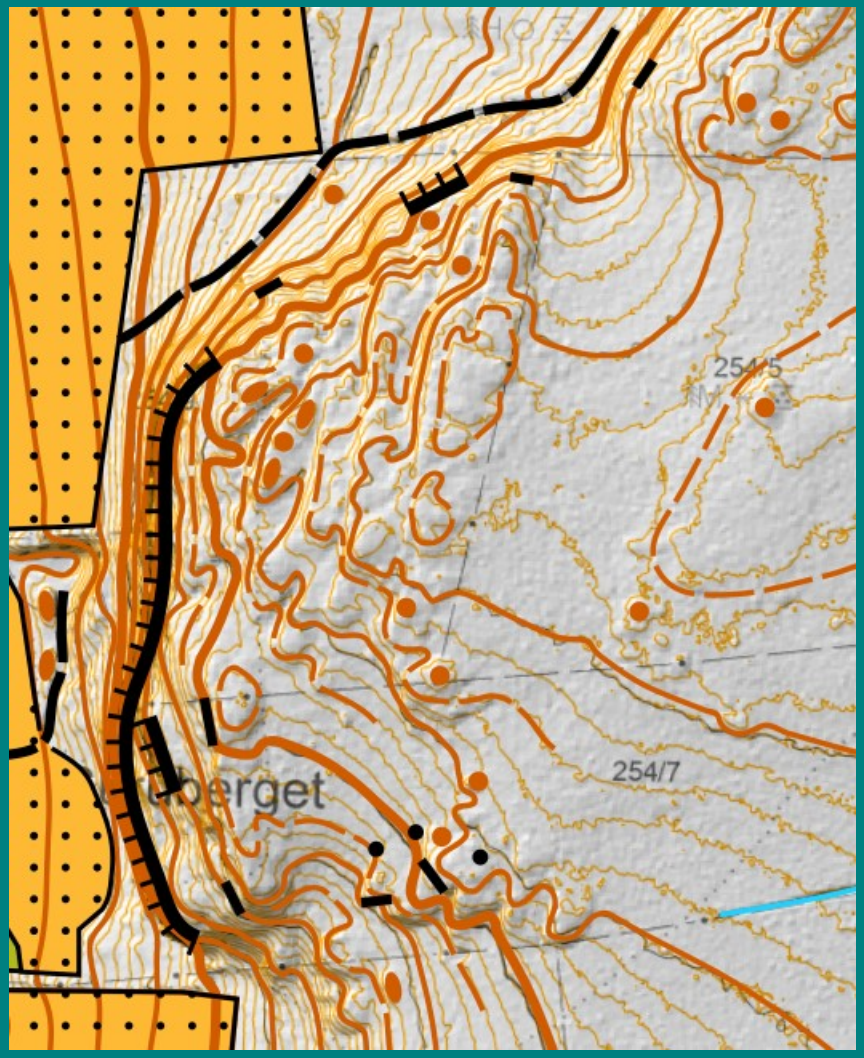


# Countour drawing

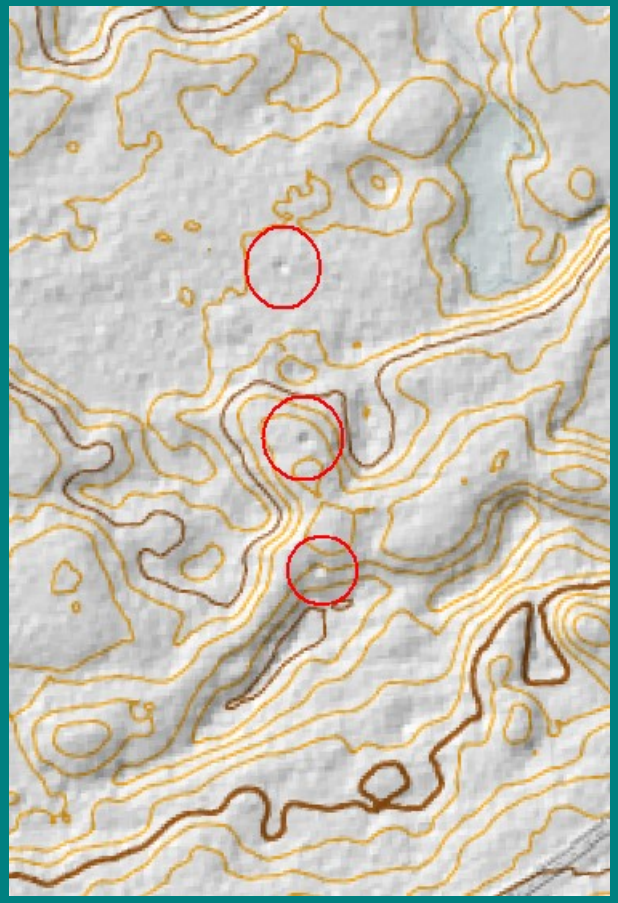
- The hillshading helps identifying landforms
- Try to draw countours that matches what runners see
- Move contours away from flat areas
- Knolls must be checked in field
- **Very easy to be too detailed.**
  - **Smoothing for better legibility**
- Old maps are allways good guidelines
- With a bit of practice, contours can be drawn more than 90% finnished

# Draw contours

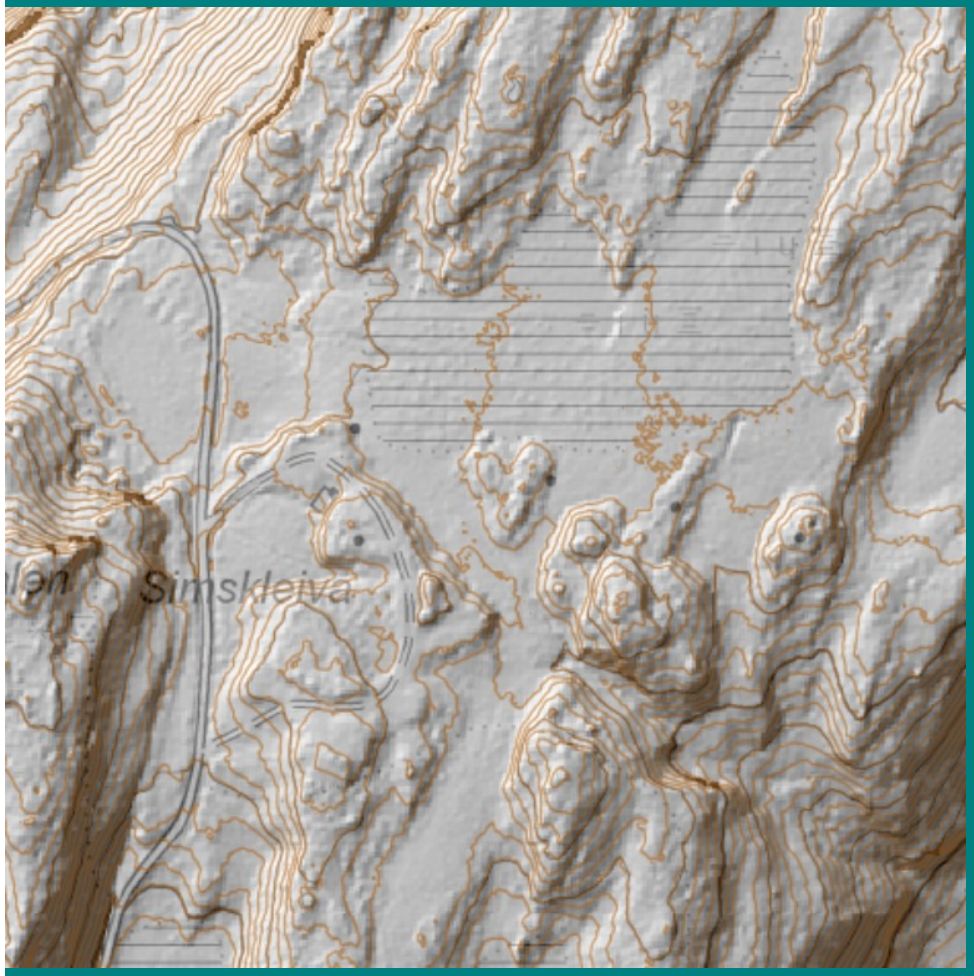


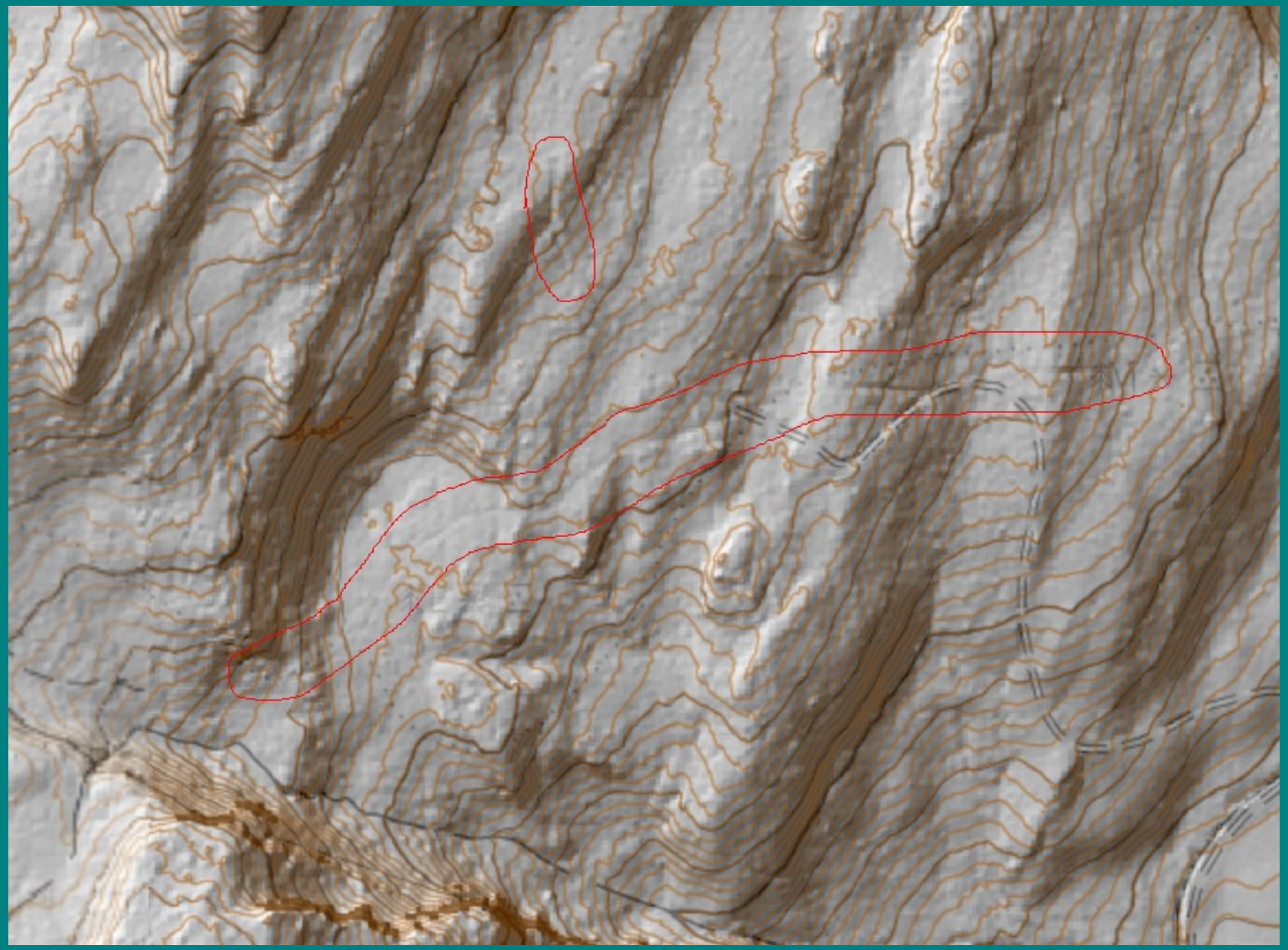
# Can even identify pits/holes



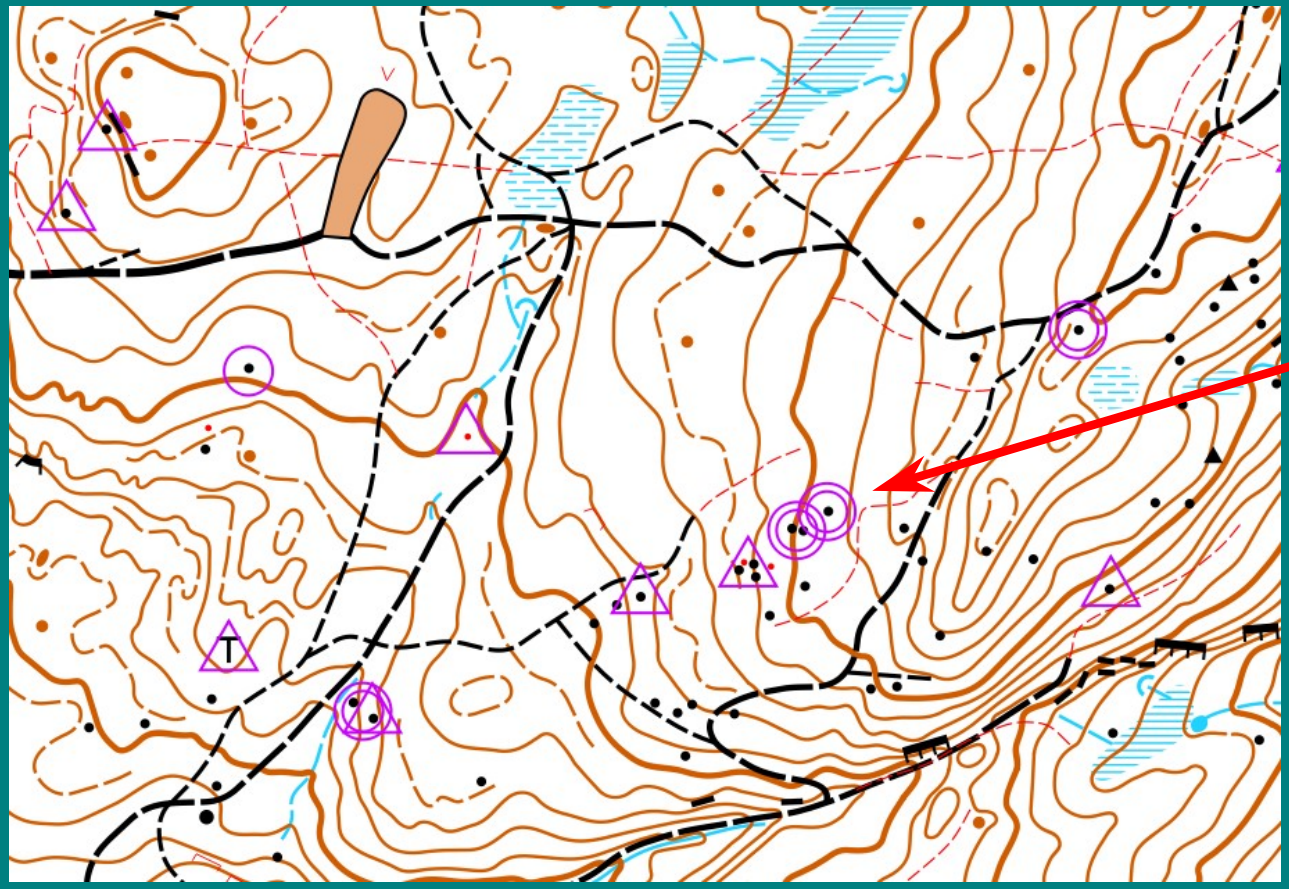
# Easy to see marsh boundaries




# Many paths can also be seen



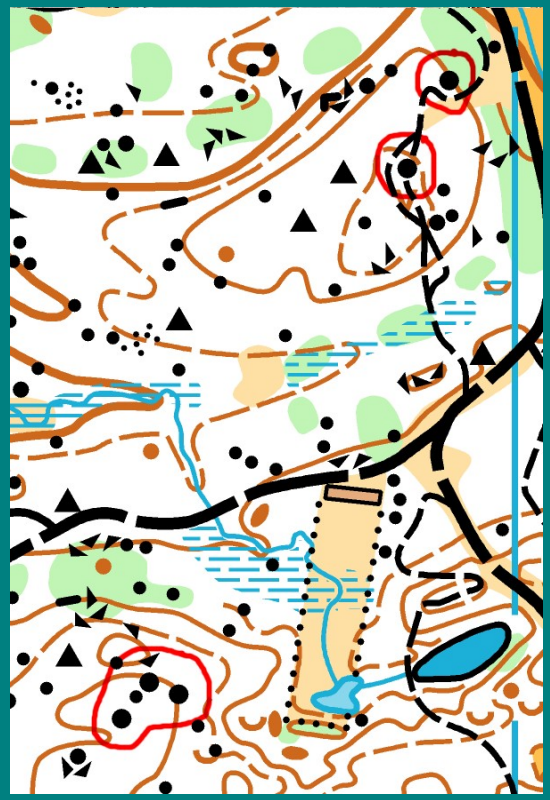
# Transfer remaining features from old map

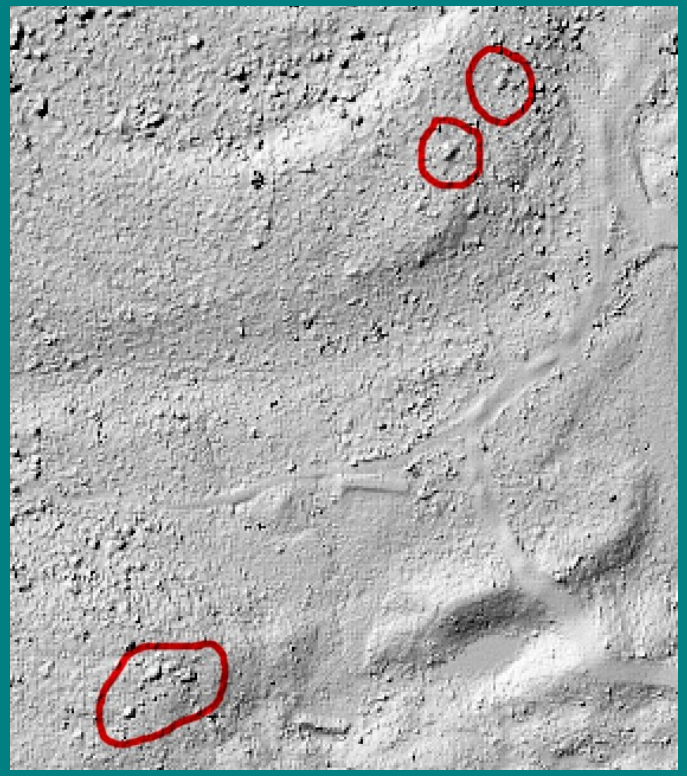


1957

Remaing features are placed relative to other features and verified in the field

# Can boulders be identified in LIDAR data?

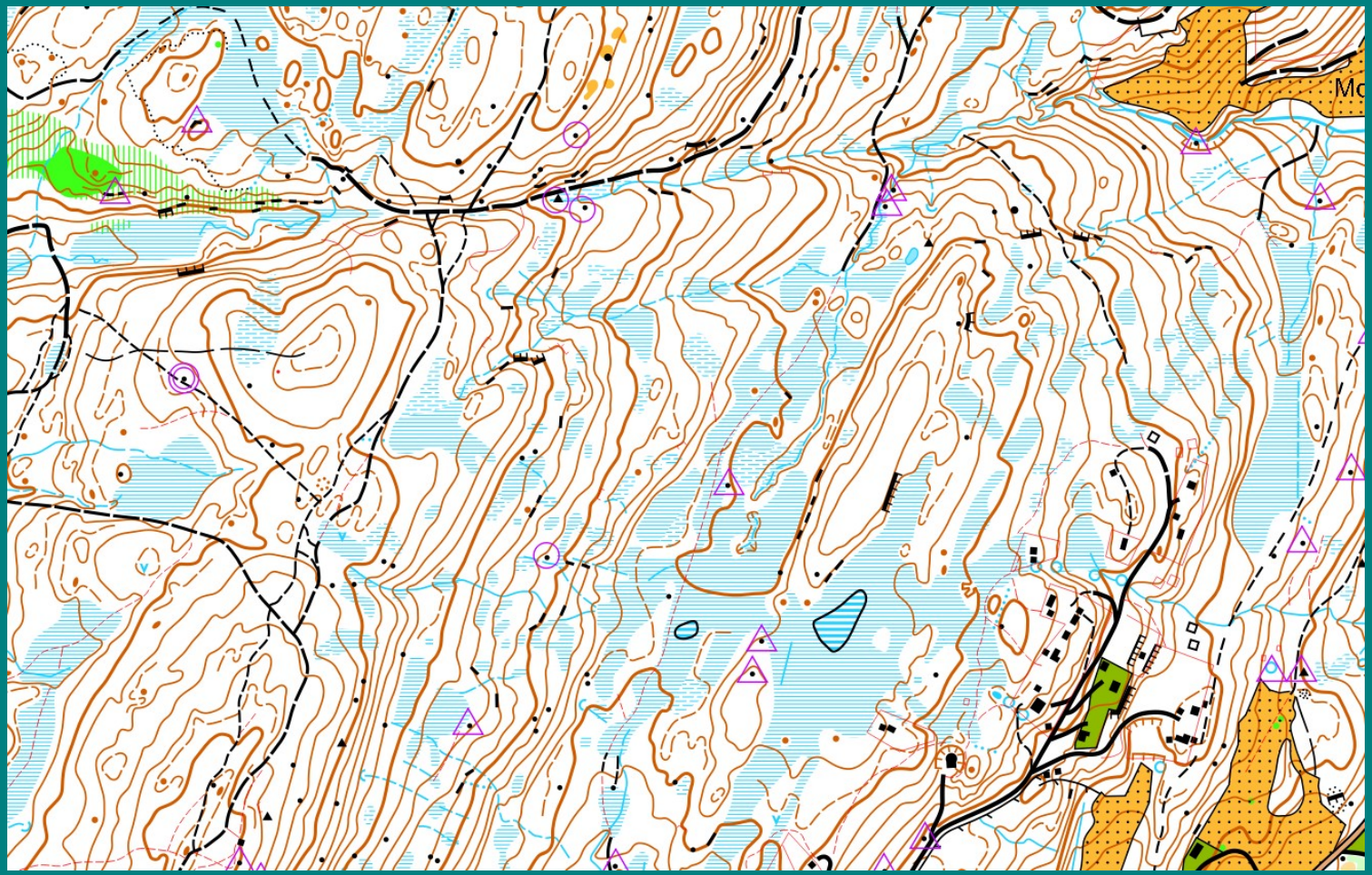




Tried different parameters in ground/surface classification and rasterize to 0.5m elevation grid.

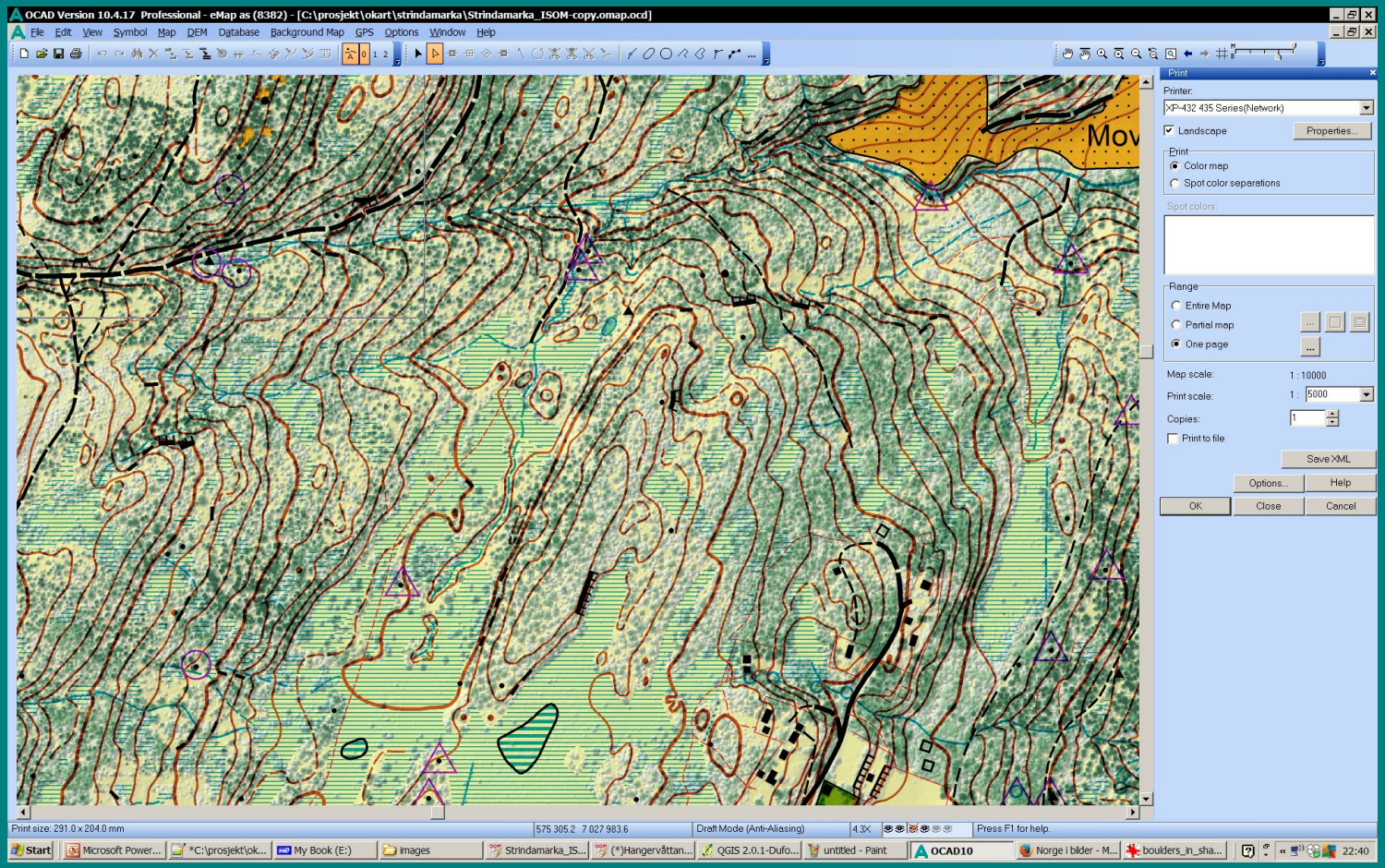
A few huge (>5m) boulders can be clearly identified as well as few normal 1m boulders.

# Preliminary map



Contains ’all’ but vegetation

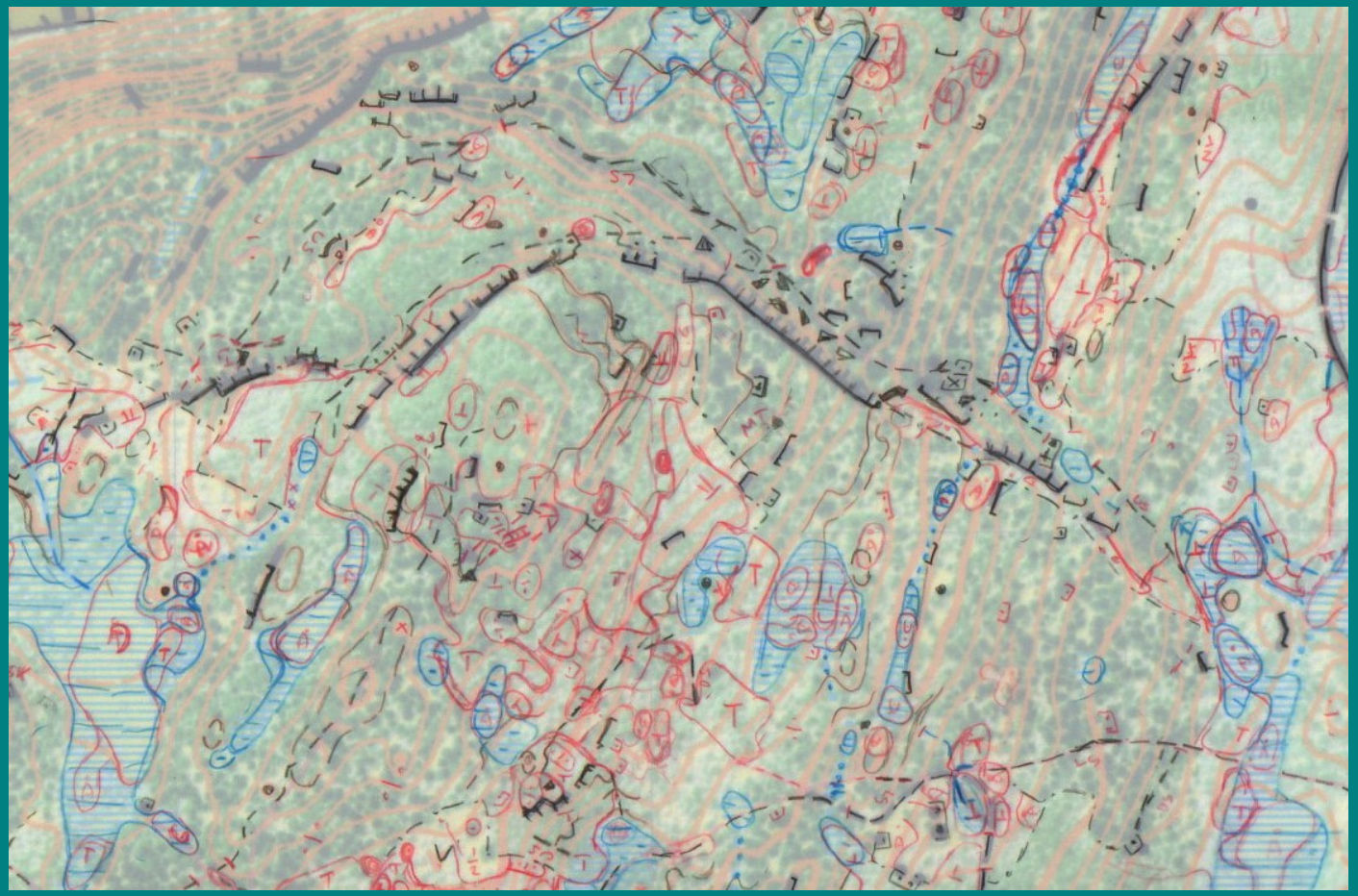
# Final basemap




Use prelinimary map together with vegetation basemap background

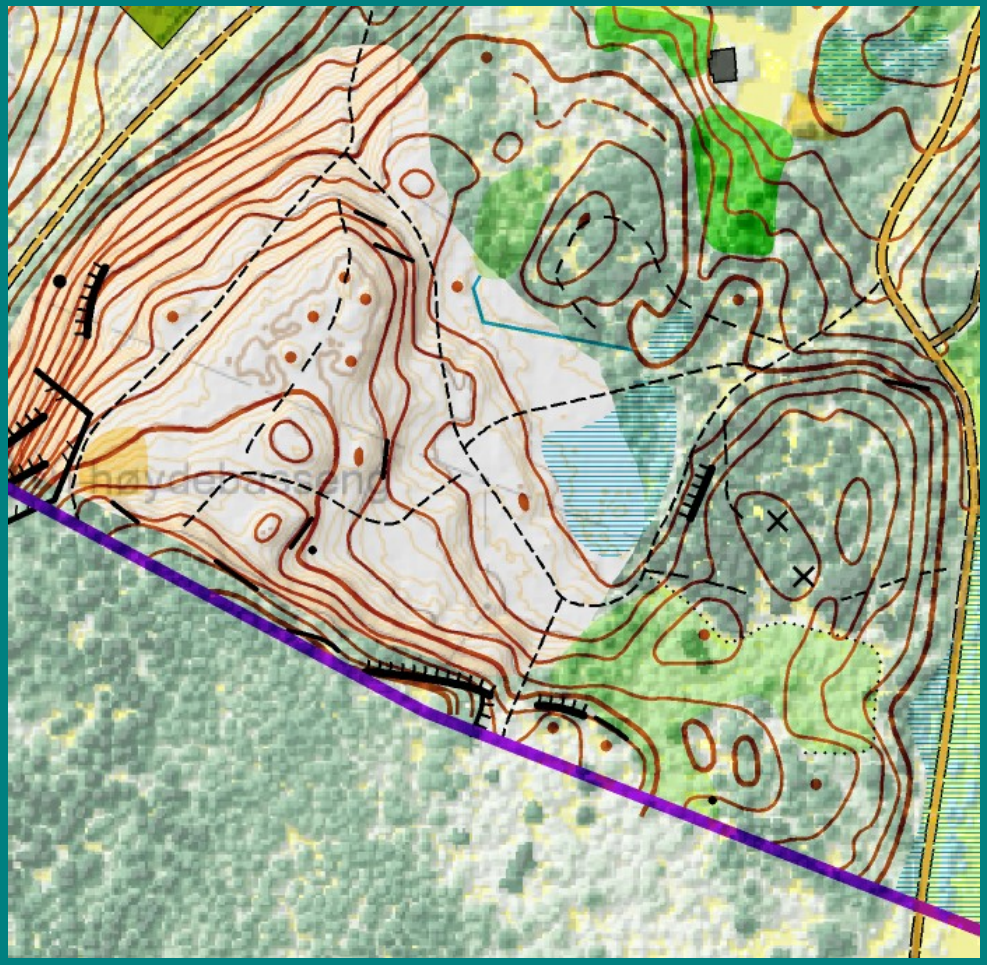
In Ocad, printing in Draft mode gives the best result

# Fast field work



- Can easilly identify single trees, and small clearings
- Generally very easy to see vegetation boundaries (unless underforest)
- Easy to place feature (g.e. boulders)
- WARNING: Also easy to be too detailed!

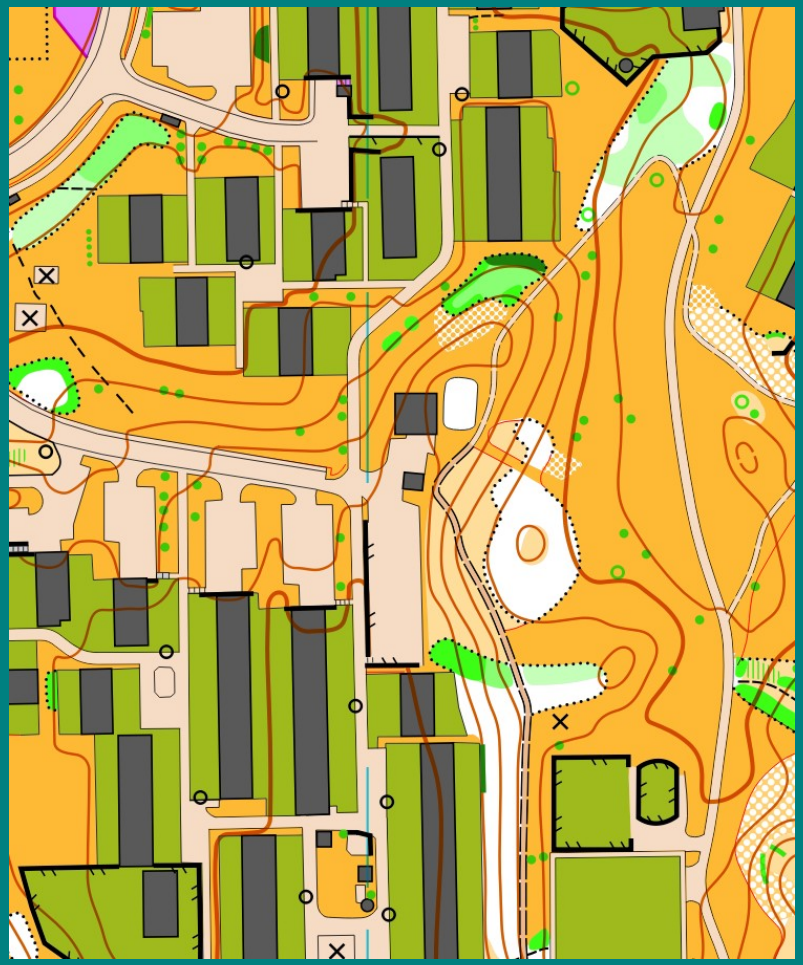
# Hybrid basemap



In areas with contour details and monotonous forest, a hybrid approach is recommended

In Photoshop, preliminary map images with vegetation and ground templates are combined, and areas with monotonous forest are masked away in favour of hill shade and 1m contours

# Sprint map



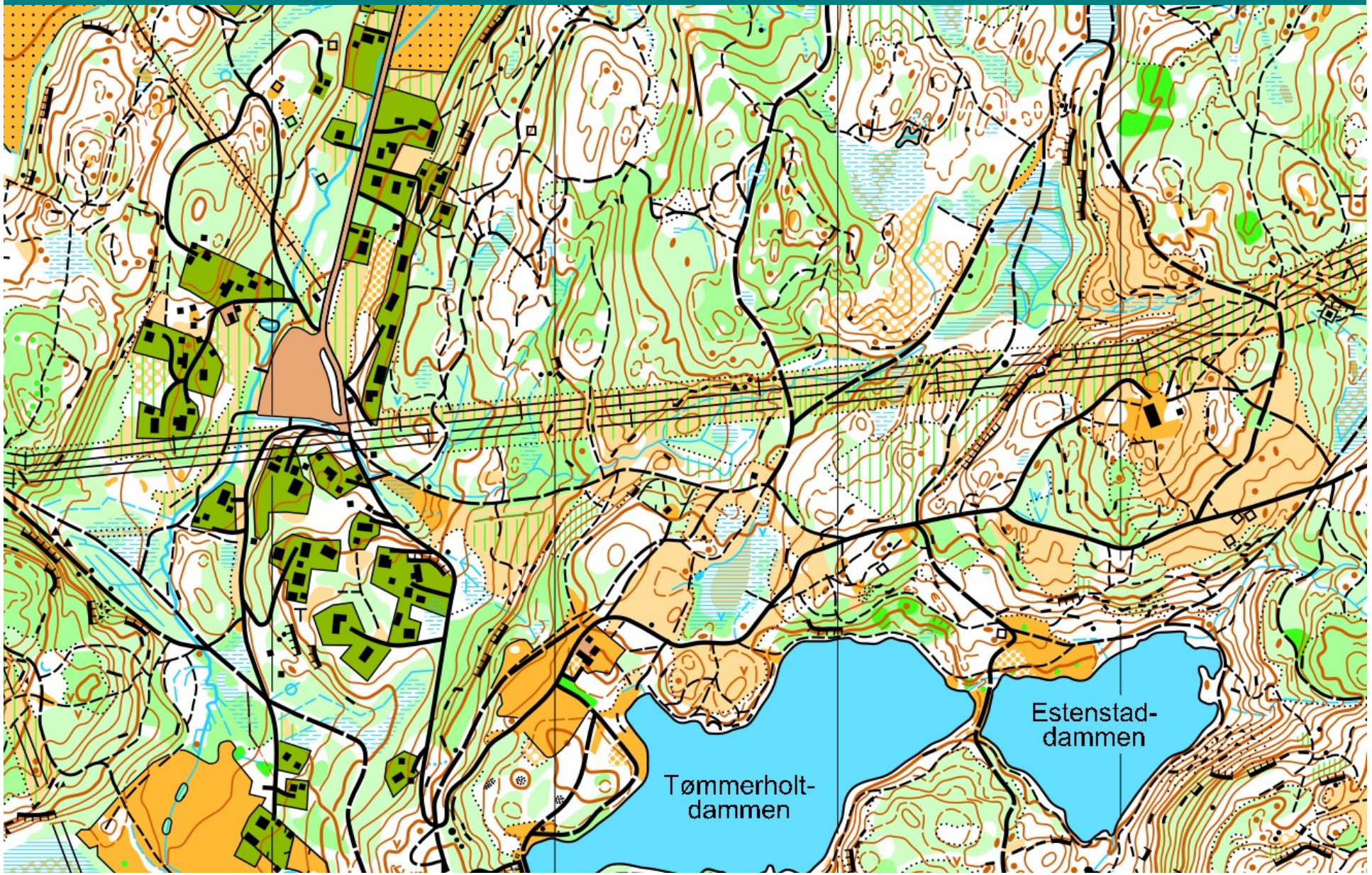
# Is photogrammetry still useful?

- There are still a few things that are better obtained from photogrammetry
  - Fences
  - Boulders (if virgin terrain)
  - Windblow, dead trees
- However, usually not difficult to place these features accurately based on the other sources

# Conclusion

- This approach requires more home work
  - The surveyer (winter preparation)
  - A club representative
  - A new profession?
- Generally faster field work with less time assessing landform and locating
- Digital devices enables background switching (less need for home work)

# Final map



” *Perfection* is achieved, not when there is nothing more to add, but rather when there is nothing left to take away ”

**Antoine de Saint-Exupéry**