

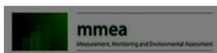
Monitoring and Risk Management in Mining Industry
REMOTE SENSING

Case study Agnico Eagle Finland Oy Kittilä gold mine area

Lentokuva Vallas Oy

Pentti Ruokokoski Geosurf Oy

repetitio est mater studiorum



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Order and task to produce an orthoimage over the whole mine site.

Purpose to:

Observe the present environment

Observe surface water behaviour

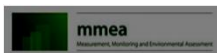
Plan the mine site infrastructure



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Implementation:

1. ORDER DESCRIPTION - WHAT IS NEEDED - ACCURACY
2. [FLIGHT PLANNING](#)
3. TERRAIN SIGNALS
4. [PHOTO SHOOTING](#)
5. IMAGE PREPARATION
6. [ORTHOIMAGE CALCULATIONS INCLUDING DTM](#)
7. IMAGE MOSAICS
8. SHARP DTM CALCULATION
9. APPLICATION CALCULATIONS



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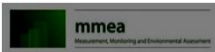
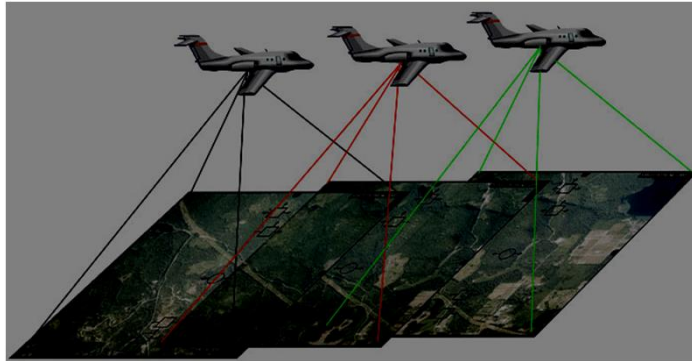
1. ORDER DESCRIPTION - WHAT IS NEEDED - ACCURACY
 - Ground truth and pixel size can vary from 5cm to 30 cm
 - Depends on usage



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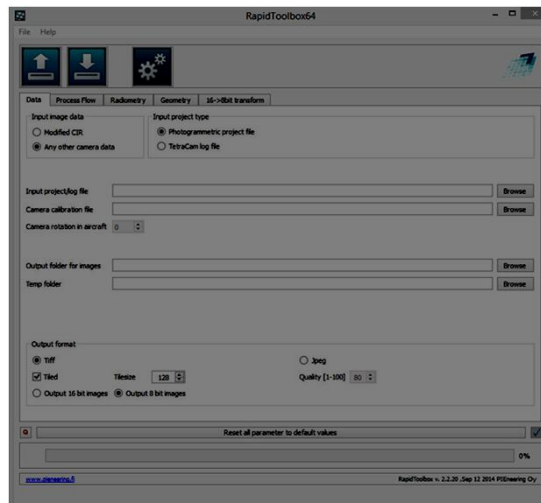
4. PHOTO SHOOTING – about 1000 images - 10 cm/pixel

Cessna, Nikon D3X, GPS



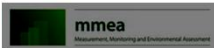
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5. IMAGE PREPARATION



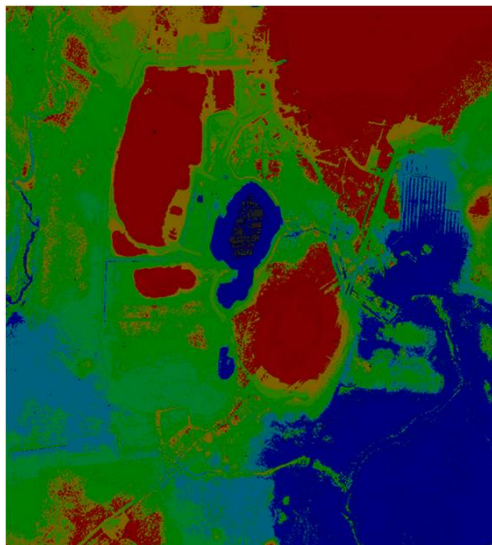
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7. IMAGE MOSAICS - detail – 10cm/pixel



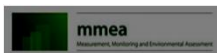
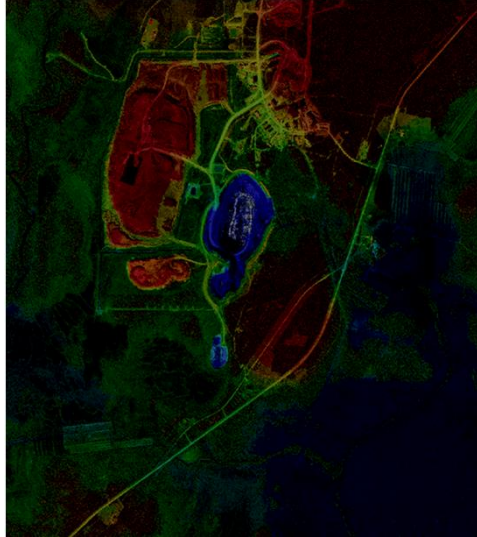
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8. SHARP DTM CALCULATION – point cloud - 50cm



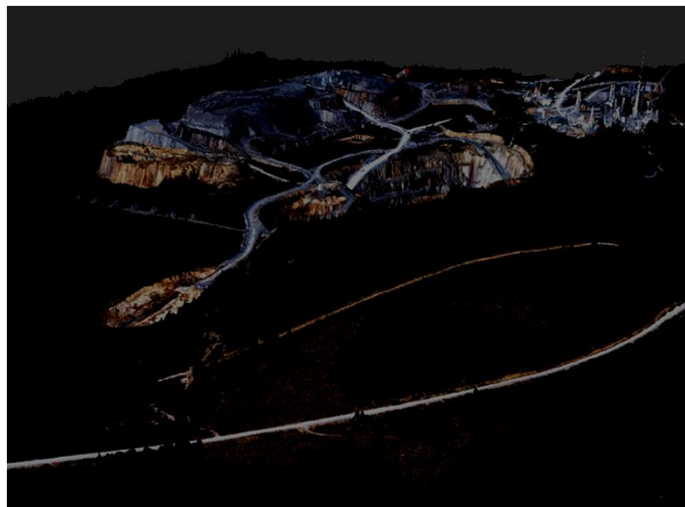
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9. APPLICATIONS – presentation - ortho+DTM



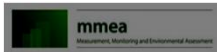
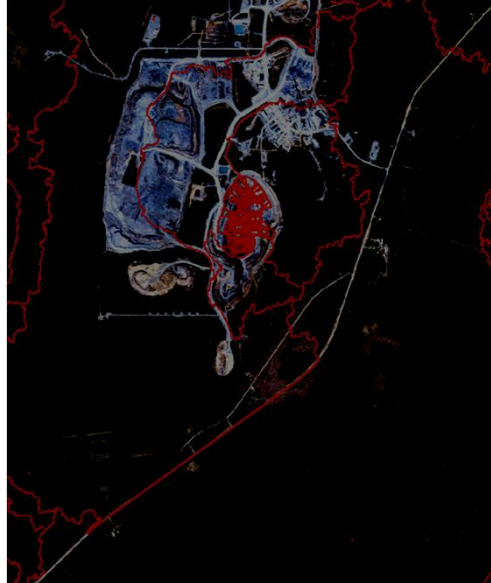
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9. APPLICATIONS - perspective



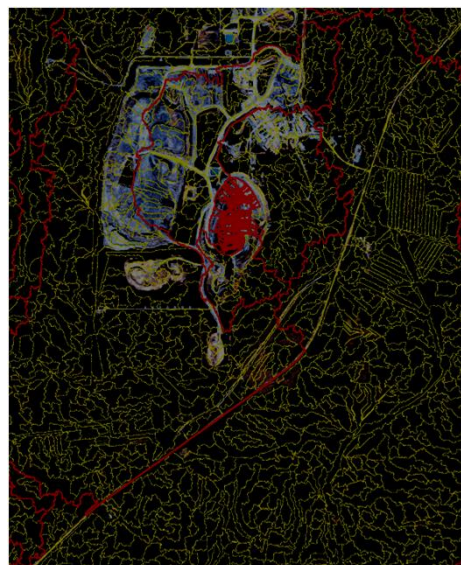
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9. APPLICATIONS – main watersheds



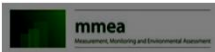
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9. APPLICATIONS – watersheds+standard basins



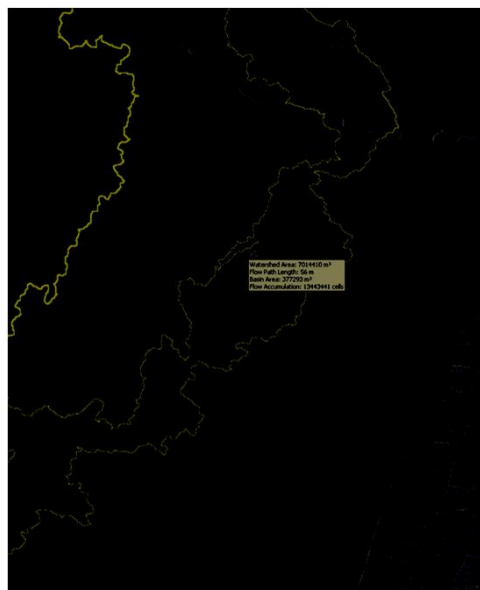
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9. APPLICATIONS – main watersheds+main flows



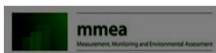
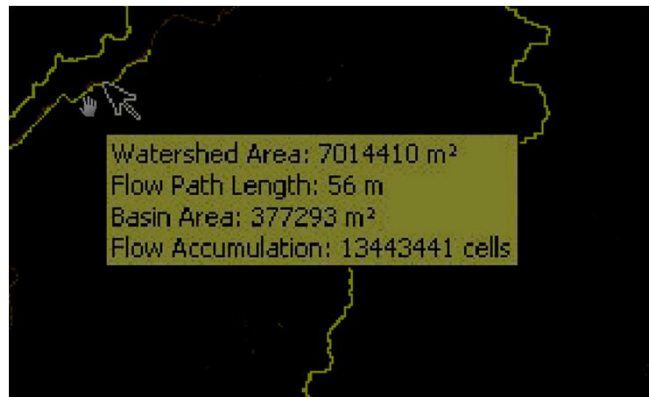
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9. APPLICATIONS – [flow accumulation](#)



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9. APPLICATIONS – flow accumulation



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Software used:

- Windows 8.1 - Microsoft Inc.
- RapidToolbox64 – PIEnengineering Oy
- RapidStation – PIEnengineering Oy
- RapidTerrain64 – PIEnengineering Oy
- EnsoMosaic – MosaicMill Oy
- TNTgis - Microimages Inc



Thank You

