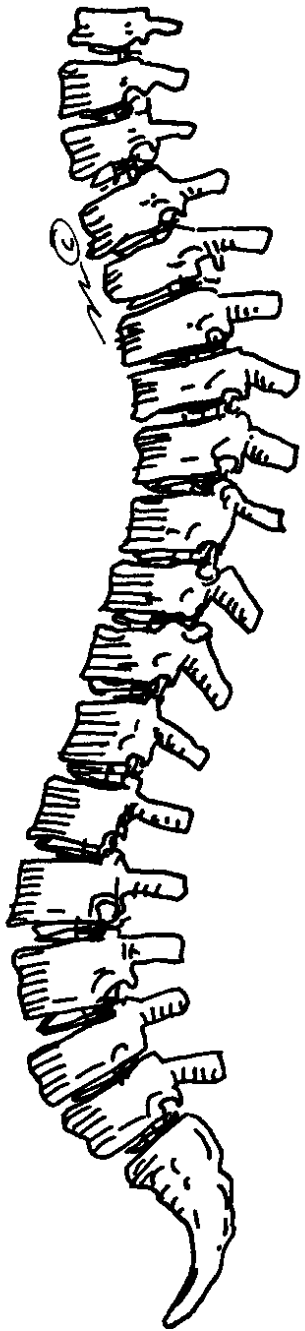


# **ISM Commission 2**

## **GEOMETRY OF MINERAL DEPOSITS and MINERAL RESOURCES MANAGEMENT**

**GEOMETRY OF MINERAL DEPOSITS**



Steinar Ellefmo

# The 3D model of the deposit and the mine plan

- Is the geometry of a mineral deposit expressed by a 3D model of the deposit?
- Is the main purpose of the 3D model that it should be the basis of the mine plan?
- The mine plan should result in decisions, and be relevant for the decisions that will be made.
- The 3D model is effected by the mine plan that is to be supported
- “Every one” needs the mine plan, increased complexity in mining, results in that “every one” is an increasing numbers of people.

# Mine surveying and the mine plan - tasks

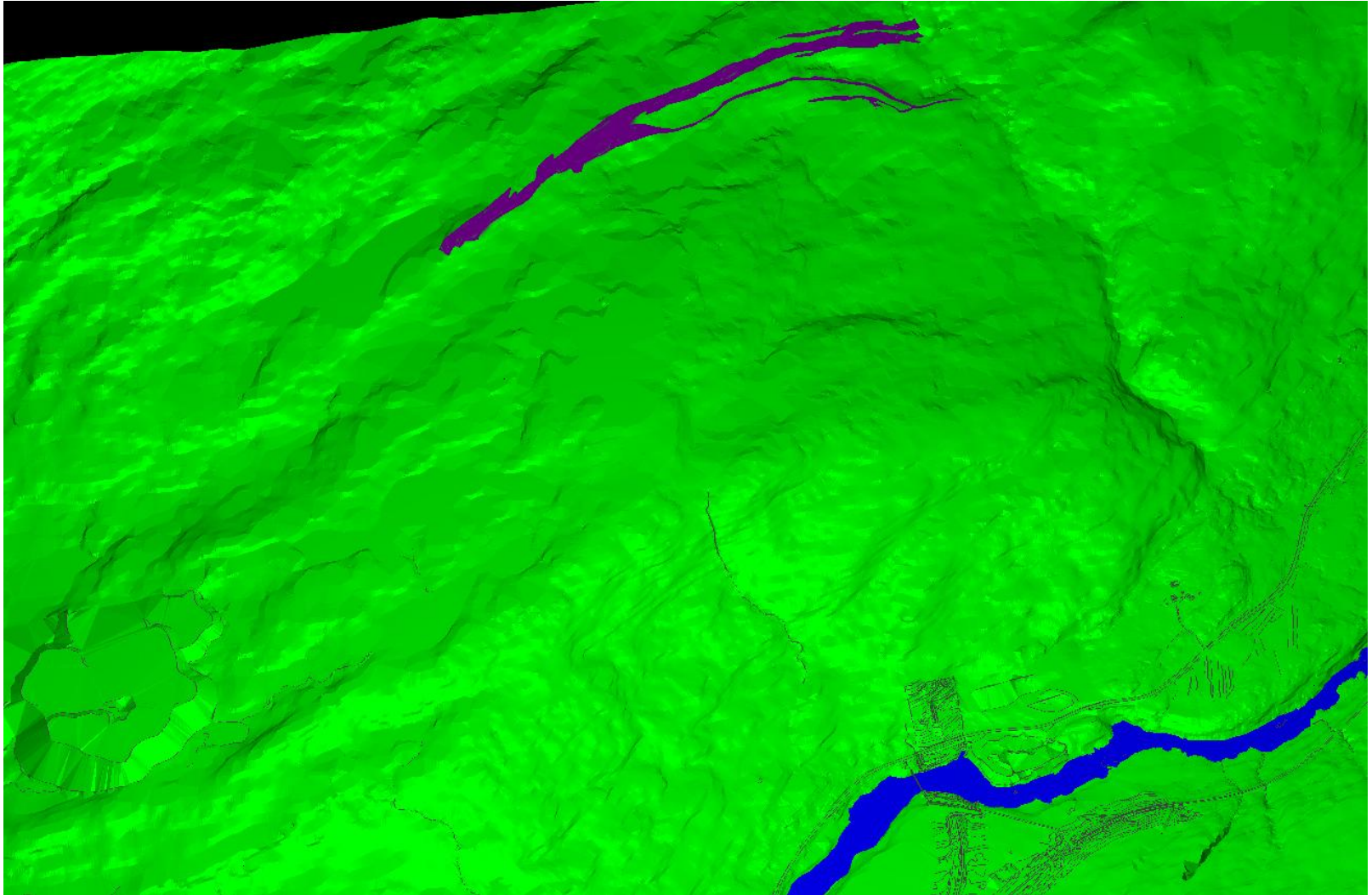
- Main processes in mineral extraction
  - Acquire the deposit
  - Develop the deposit
    - On a strategic and tactical level
  - Produce and deliver from the deposit
    - This process gives new geological information that can be used for updating the 3D model
  - Decommission (restoring)

# Building and using 3D models

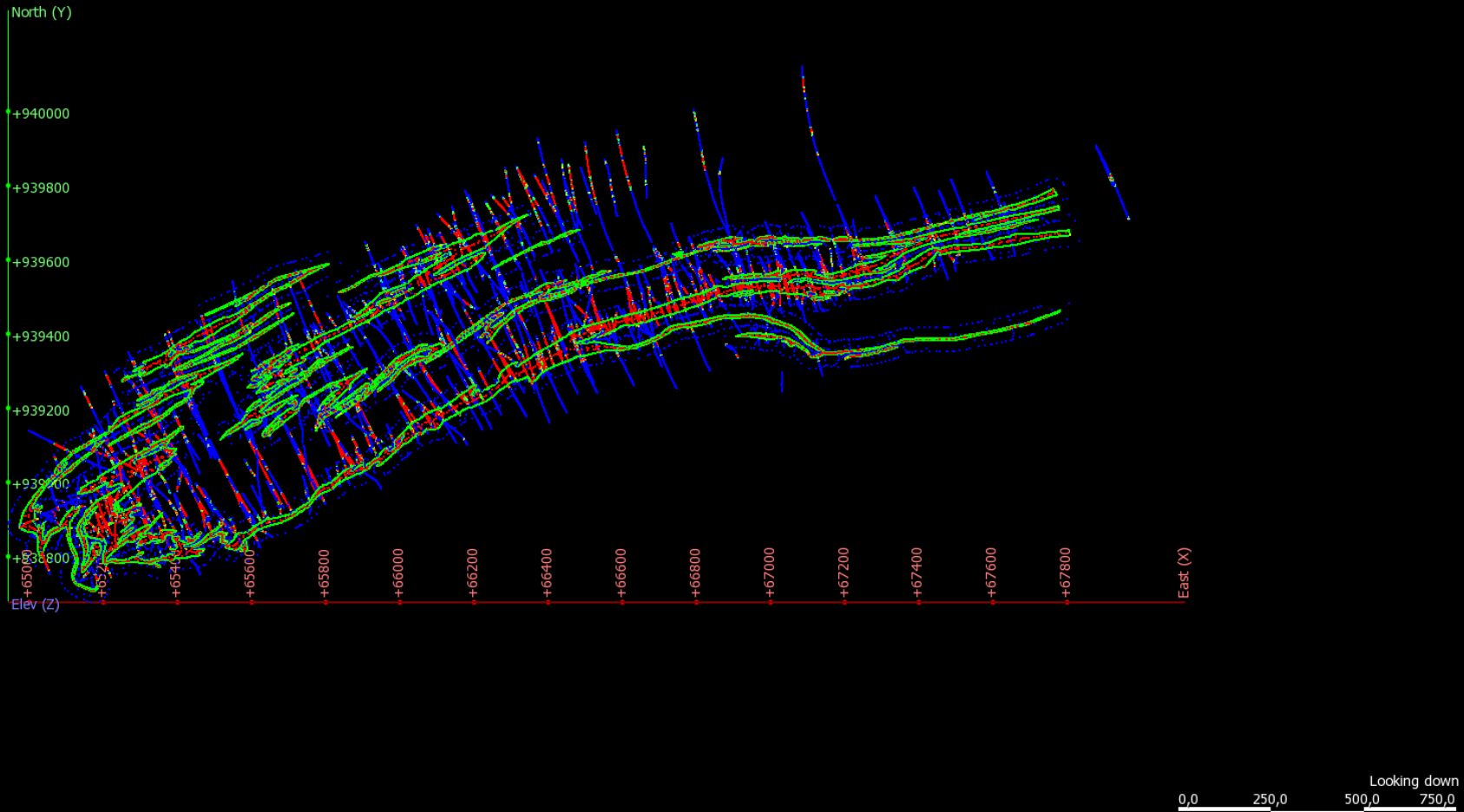
- How are the models constructed?
- How are the models used?

# 3D modellening?

A mine map draped on a surface



# Implicit geological modelling



North (Y)

+940000

+939800

+939600

+939400

+939200

+939000

+938800

Elev (Z)

+600

+400

+200

+100

0

+65200

+65400

+65600

+65800

+66000

+66200

+66400

+66600

+66800

+67000

+67200

+67400

+67600

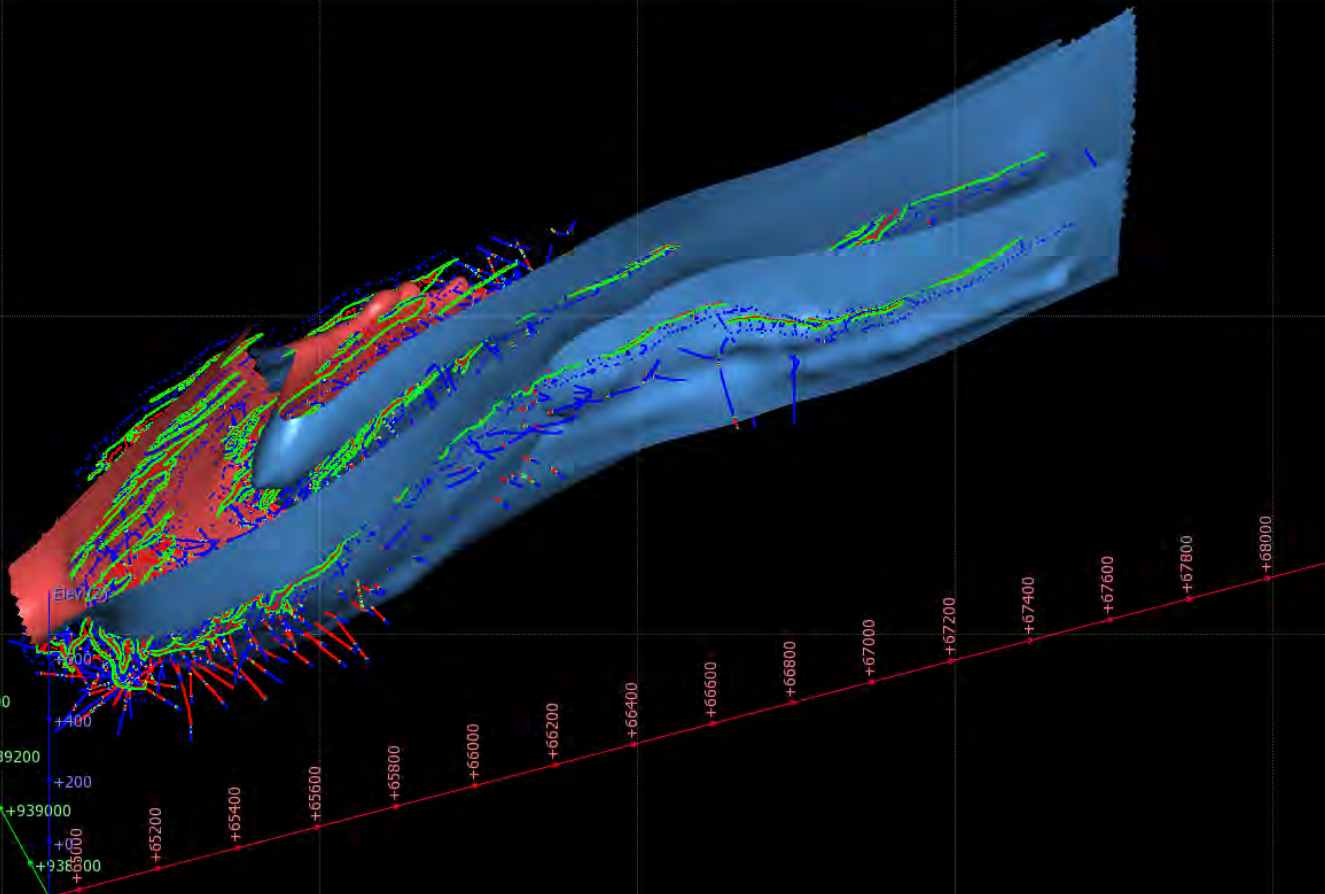
+67800

+68000

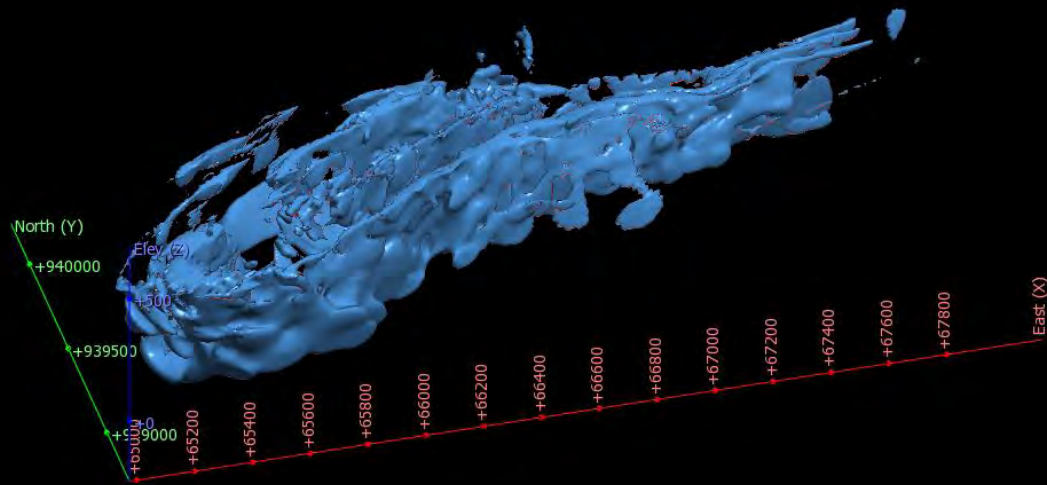
East (X)

Plunge +44, Azimuth 021

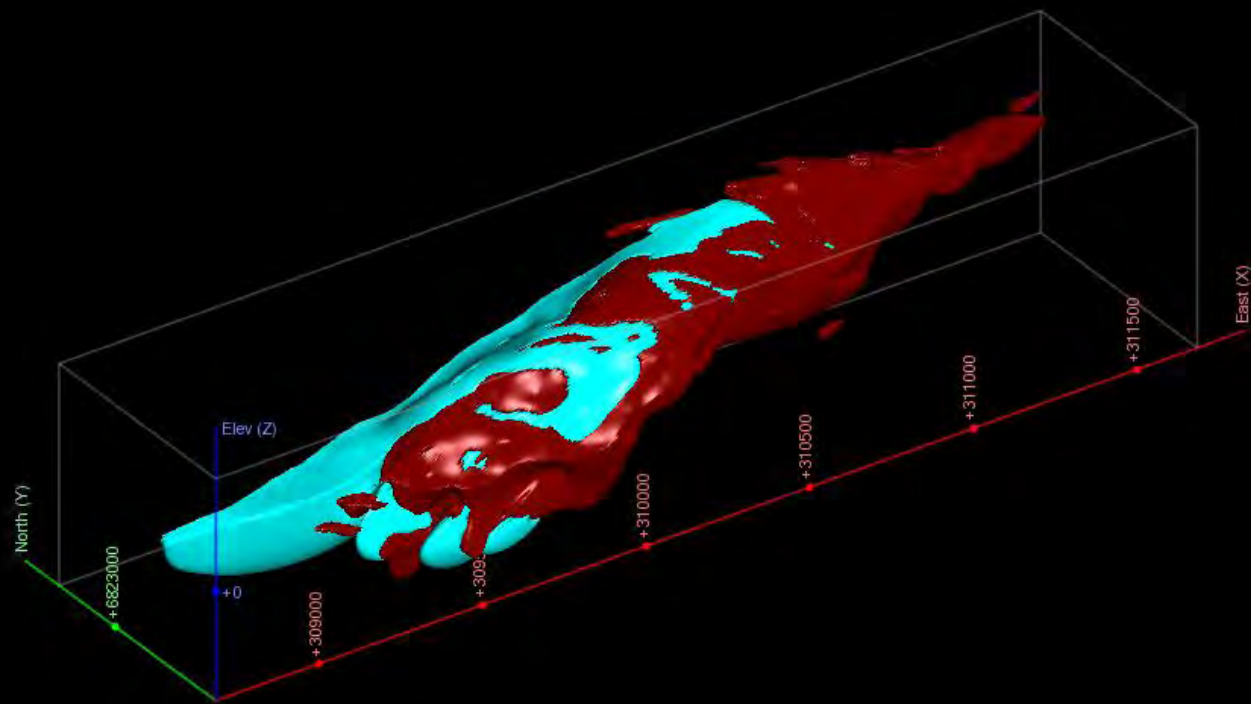
0,0 250,0 500,0 750,0





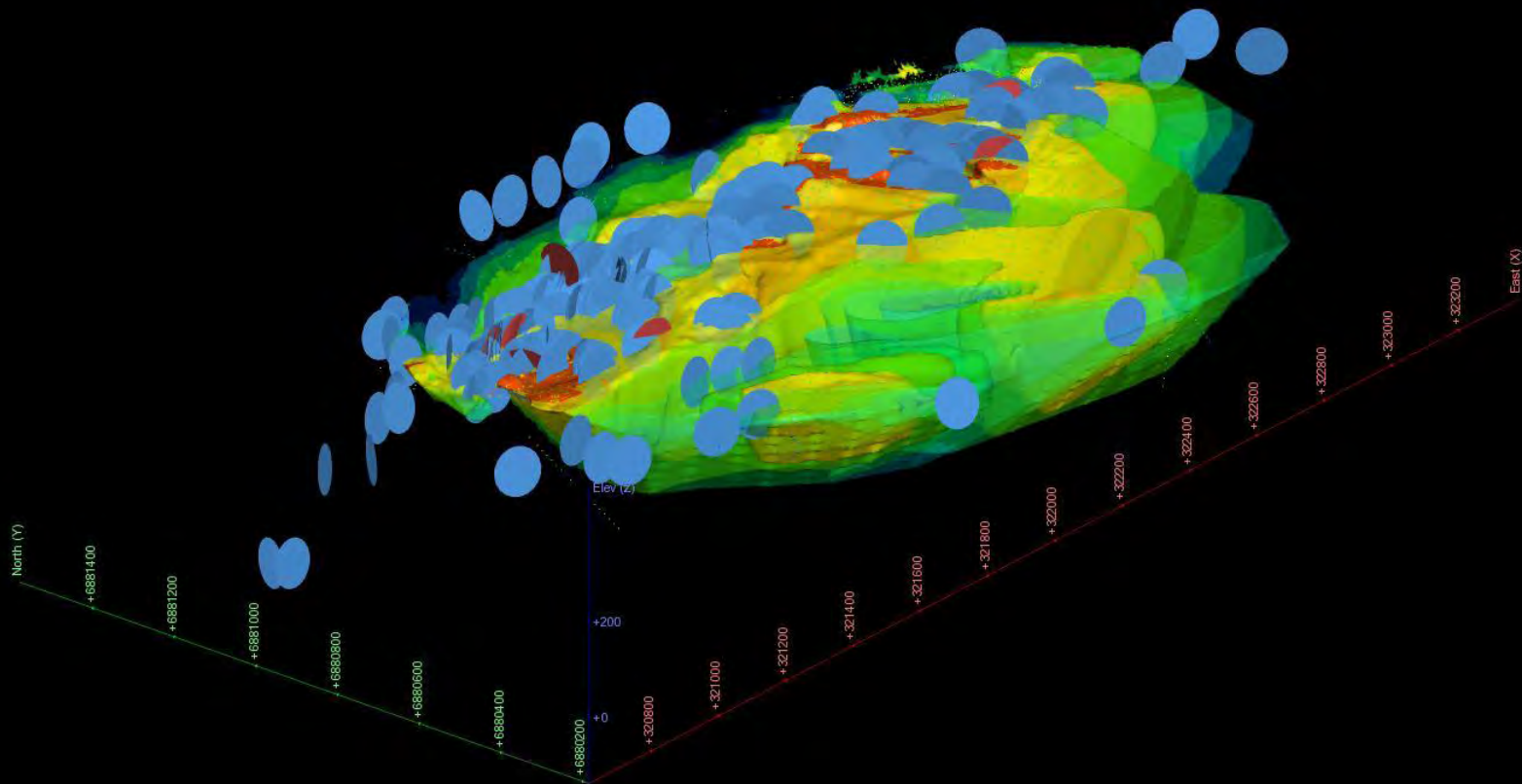


Plunge +36, Azimuth 015  
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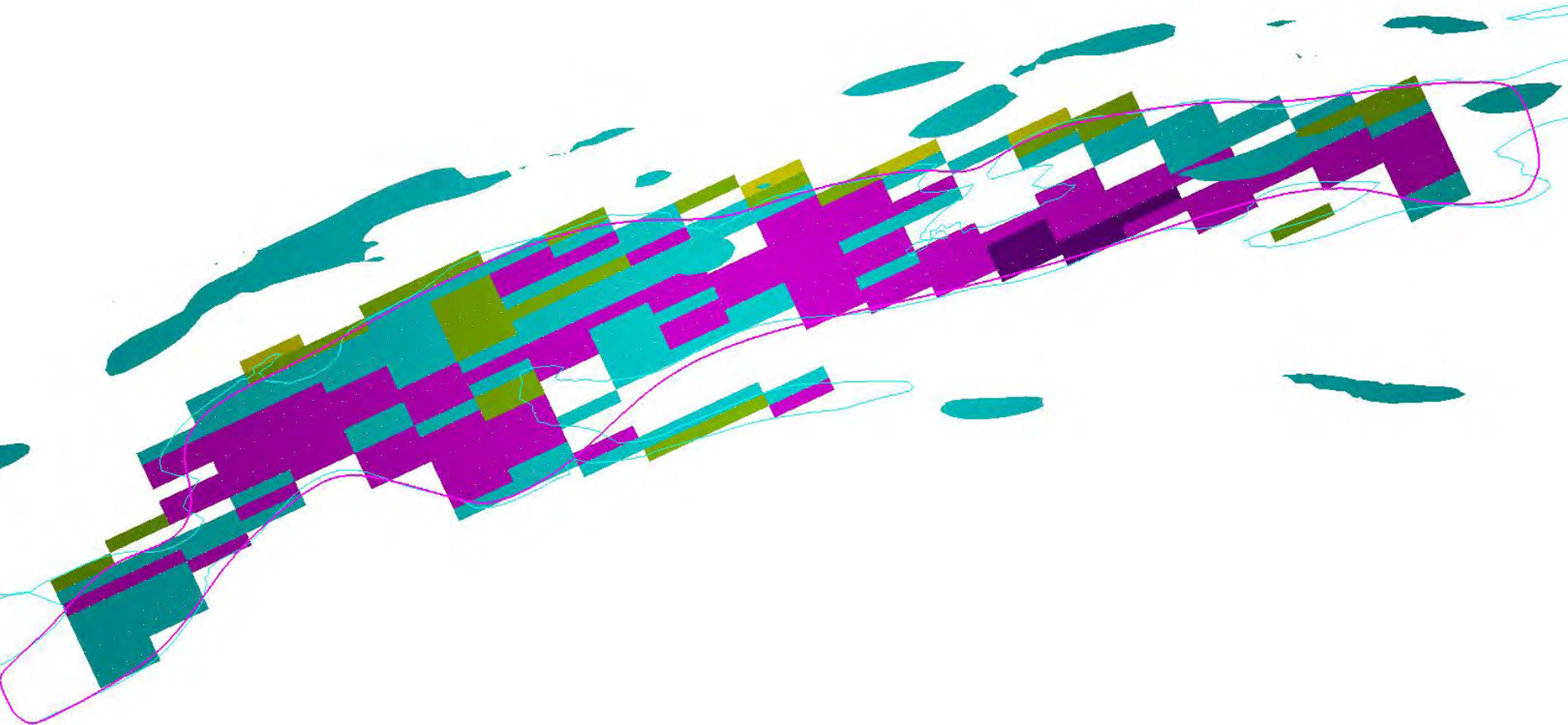


Plunge +31 Azimuth 035

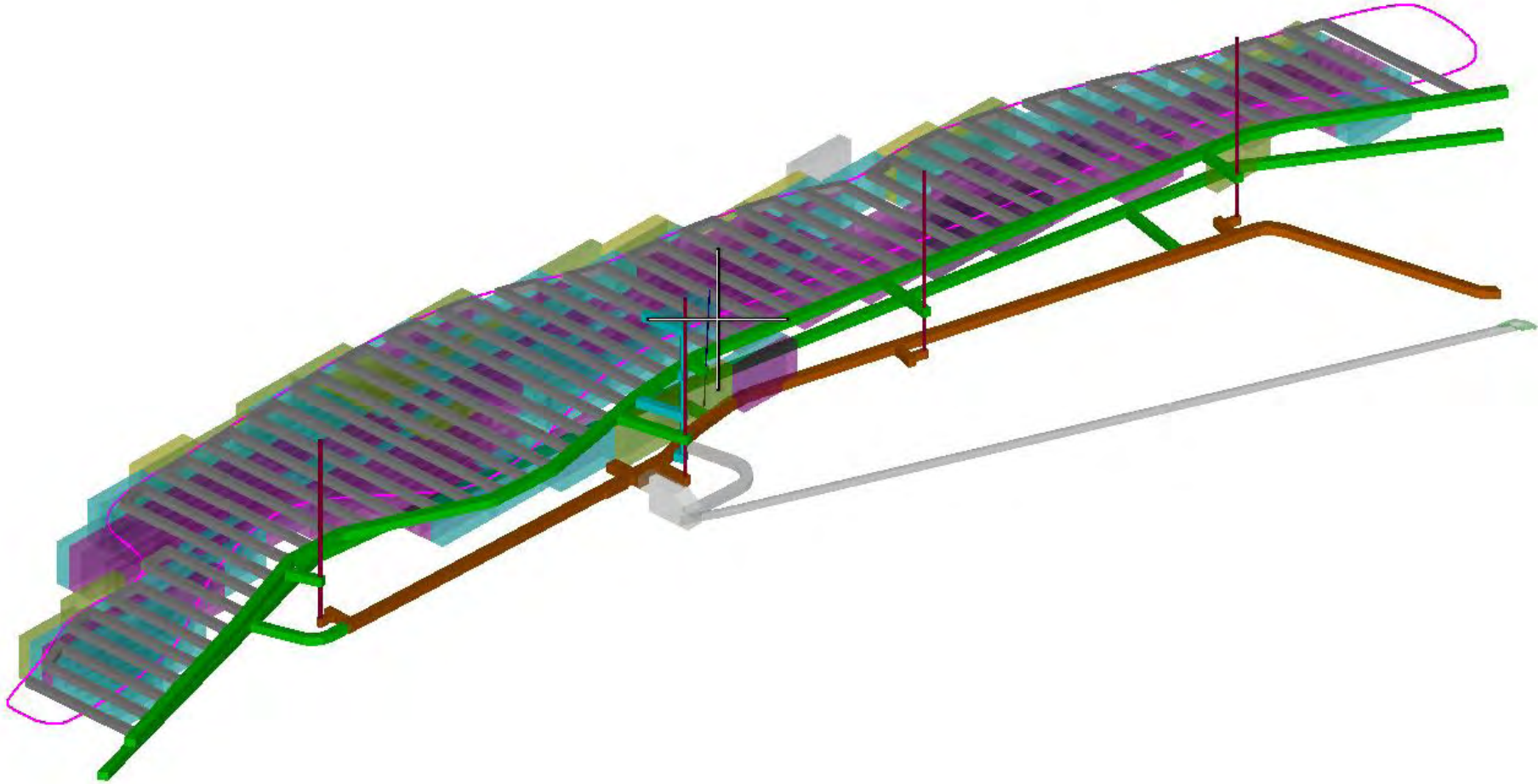


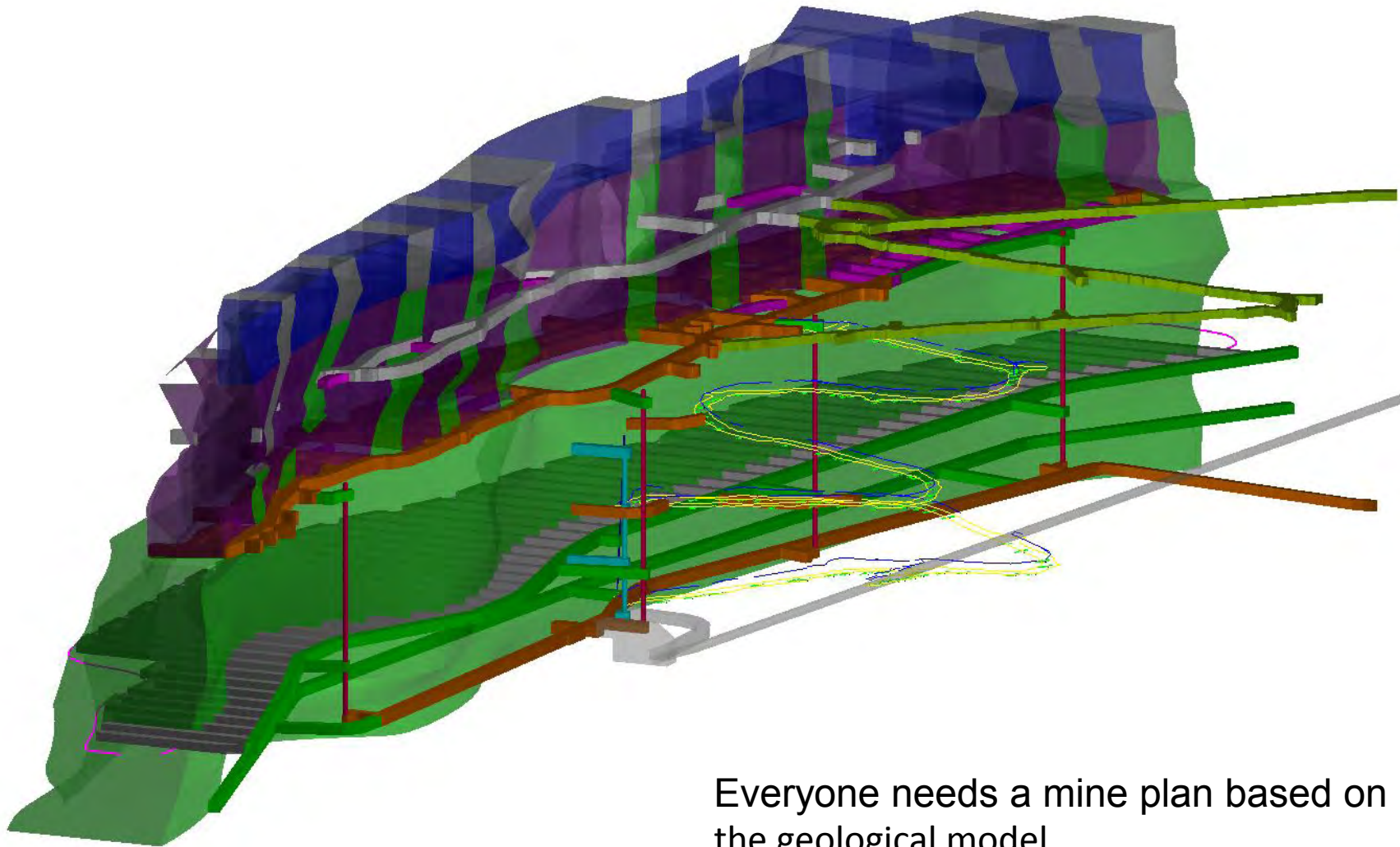


Based on strategic decisions we distinguish between the geological model and the operational model.



The operational model is basis for the mine plan





Everyone needs a mine plan based on the geological model

# The steps in 3D modelling

- Data collection
- Data storage
- Evaluation of the data
- Presenting data.
  - In form of a geological model or a deduction of the model

# Systems for evaluation of data

- Office
  - Microsoft Office, Adobe Acrobat
- Drawing
  - Adobe Photoshop, Corel Draw
- Surveying
  - Gemini, V/G-land
- DAK
  - AutoCad og MicroStation
- GIS
  - ArcGIS, GIS/LINE, Google Earth
- Databases
  - Microsoft Access, Microsoft SQL Server, Oracle
- Geostatistics and modelling
  - Isatis, GSLIB, leapfrog



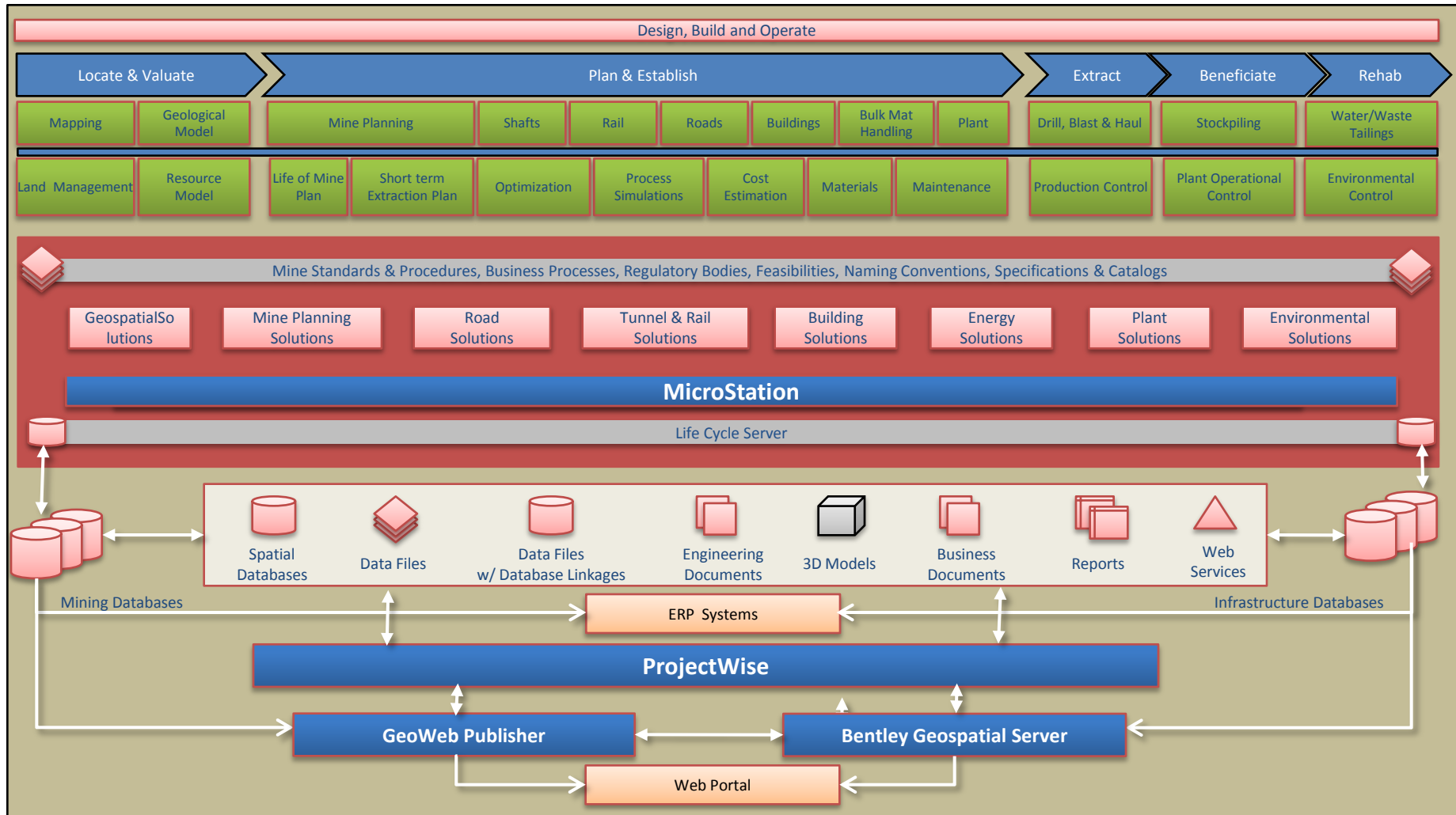
# Sector specific systems

- Datamine
- Gemcom
  - GEMS og Surpac
- Vulcan

# General purpose systems contra Sector specific systems

- More demanding to set up the workflow
- Needs sector specific add-ons
  - The strength
    - Flexibility and access to latest technology

# Solution Mining and Metals, additional modules for MicroStation



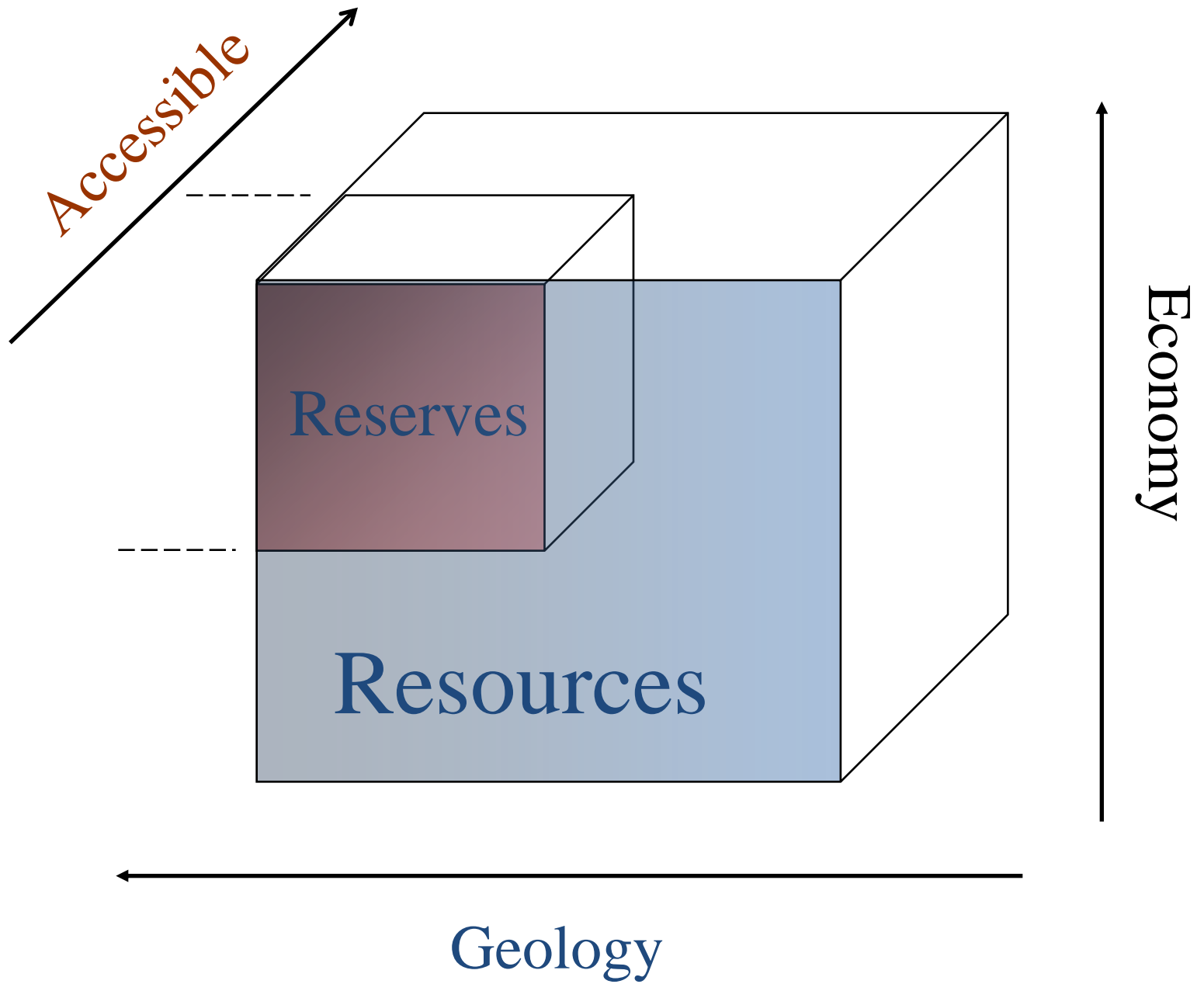
# **ISM Commission 2**

## **GEOMETRY OF MINERAL DEPOSITS and MINERAL RESOURCES MANAGEMENT**

Mineral resources management

# What is the difference ?

- Mineral resources management
- Due diligence
- What are mine surveying tasks?



# From the municipal master plan to the mine plan - Norway

- Municipal master plan
- Local development plan
  - Impact assessment
    - Geology
    - Emissions
    - Landscape
    - Community life and outdoor life
    - Natural environment
    - Cultural heritage
    - Natural resources
  - Maps and regulations
- Mine plan (extraction plan)