



# Exploration

Capital Markets Day 6 September 2011

Hans Årebäck  
Exploration Director

**BOLIDEN**

# Exploration

It all started with exploration in the early 1920:ies



Drill rig at Fågelmýran in Boliden 1924

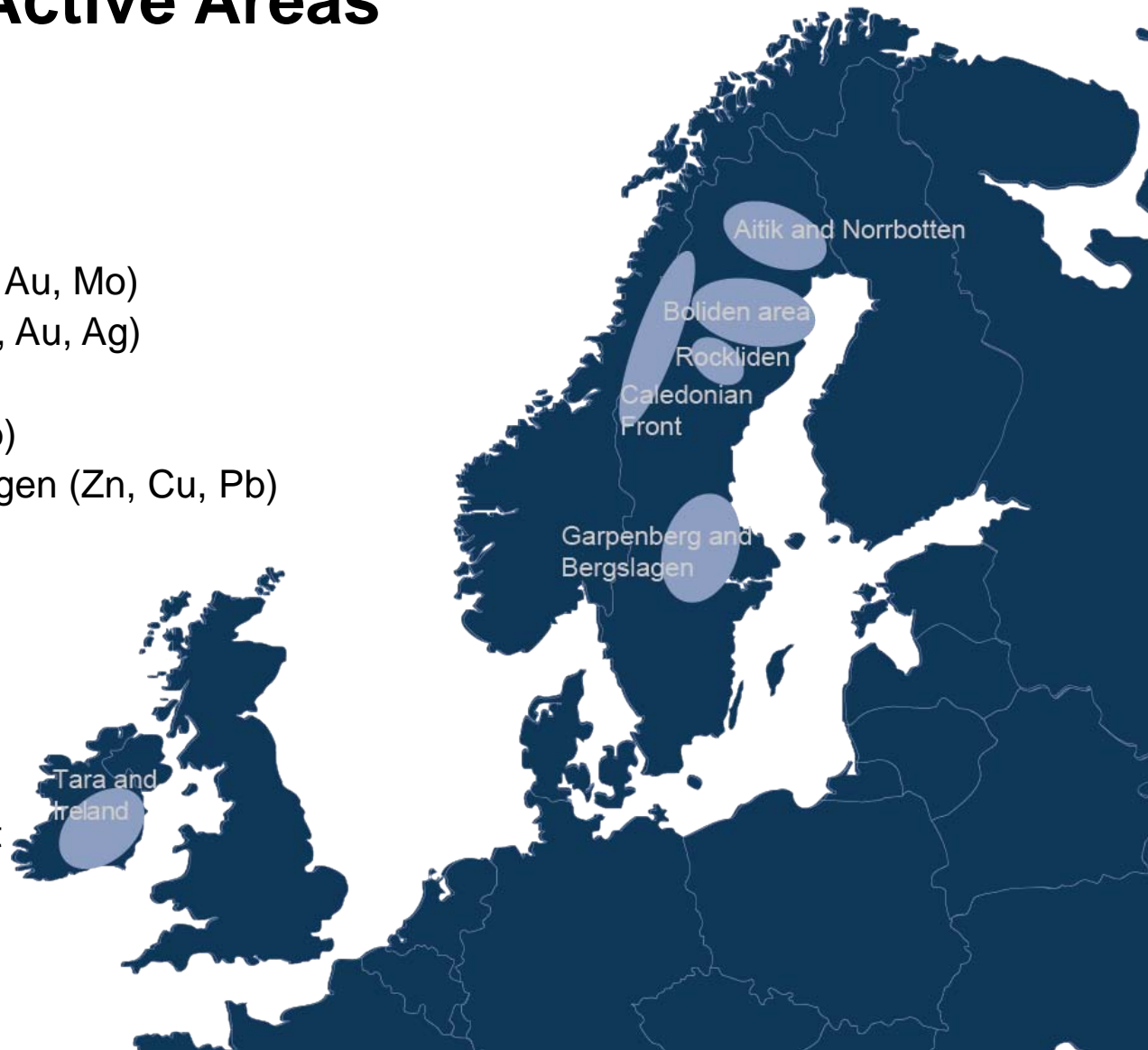
# Exploration - Active Areas

## Sweden:

- Aitik and Norrbotten (Cu, Au, Mo)
- Boliden area (Zn, Cu, Pb, Au, Ag)
- Rockliden (Cu, Zn, Ag)
- Caledonian Front (Zn, Pb)
- Garpenberg and Bergslagen (Zn, Cu, Pb)
  - 2.000 km<sup>2</sup> (157 licenses)

## Ireland:

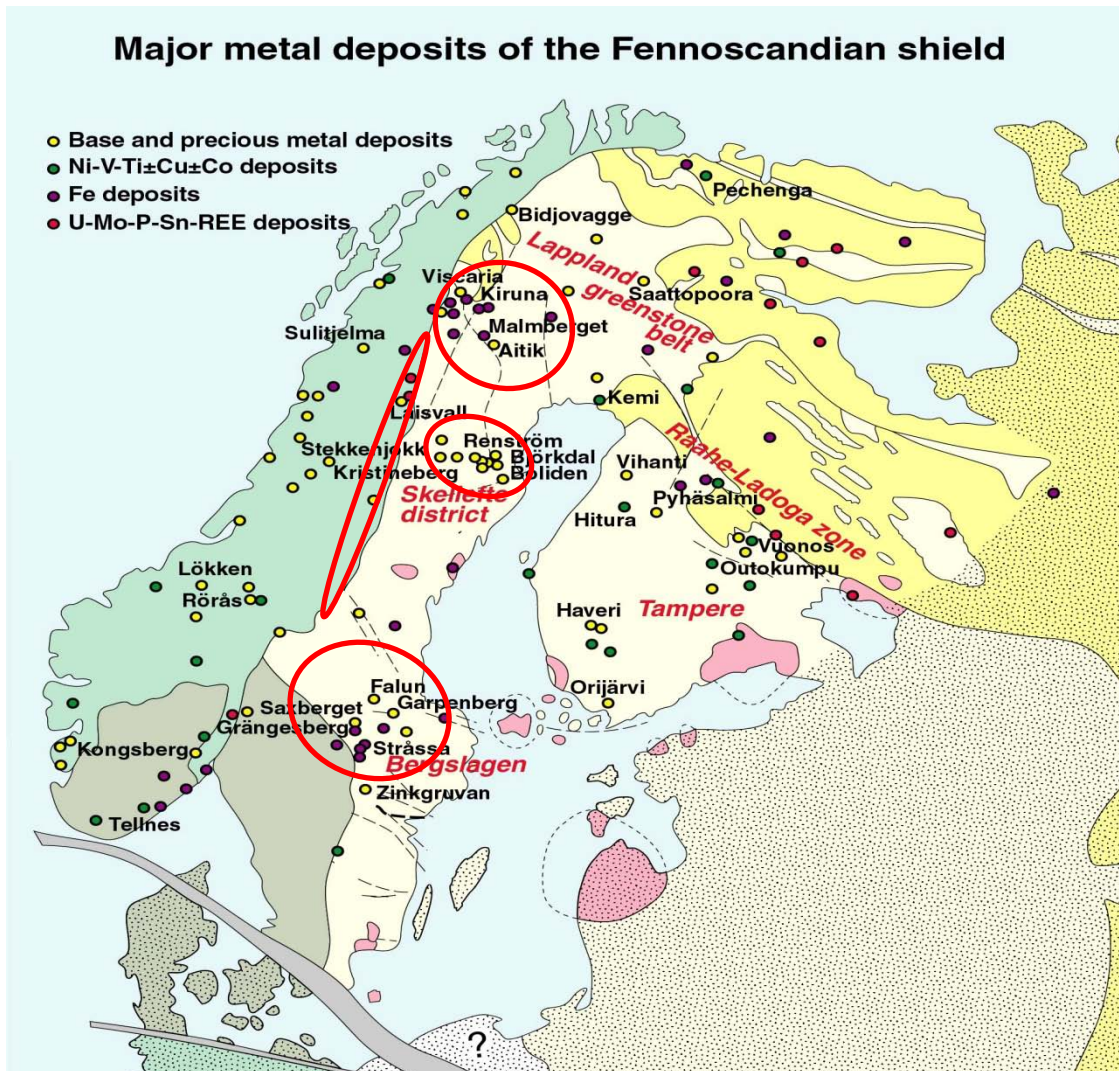
- Tara
- Limerick
- Tullamore
- Strokestown & Slievedart
  - 3.040 km<sup>2</sup> (95 licenses)





# Exploration

## The right geological environment



### Area Selection Criteria

- Geological potential
- Mineralisation type (main metal, grade etc.)
- Environmental restrictions

# Exploration

## Key factors in successful exploration

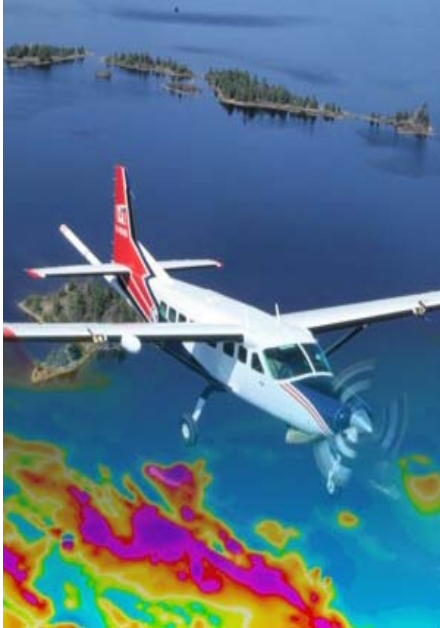
- Geological and geophysical expertise enabling new target areas to be successfully identified
- Access to areas of land and cooperation with local residents affected by the exploration work
- Development of methods and technology that increase the efficiency and precision of the work
- Long term planning, time from the first exploration activity to mining operations is normally in excess of 10 years
- Conduct our work in a safe manner and with good quality



# Exploration

## How we work –Geophysics and Geology

### Geophysics



Surveying and processing physical properties of the earth in the search of minerals deposits



### Geology



The study of rocks enables geologists to make predictions as to where mineralization could be found.

Zooming in to targets

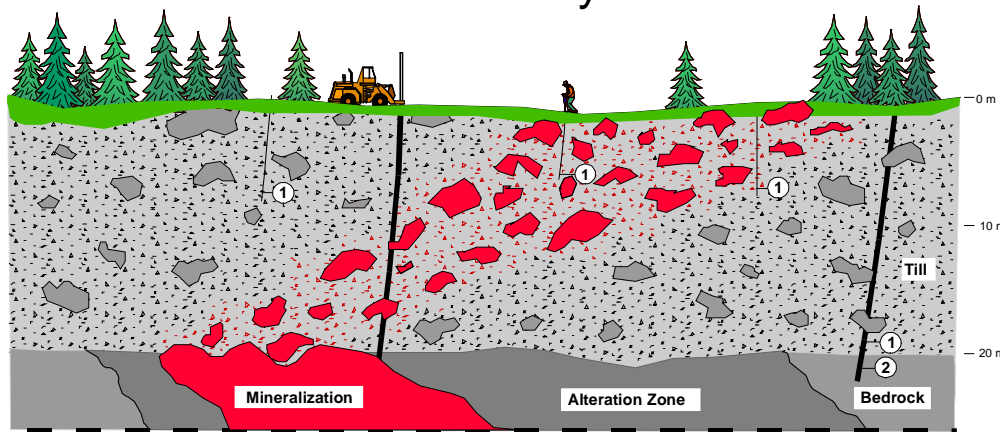




# Exploration

## How we work – Geochemistry and Drilling

### Geochemistry



- Drilling with tractor-mounted drill
- Sampling with handheld drill

- ① Till sampling
- ② Bedrock sampling

Sampling and assaying the soil and top bedrock in the search of mineral deposits

### Drilling



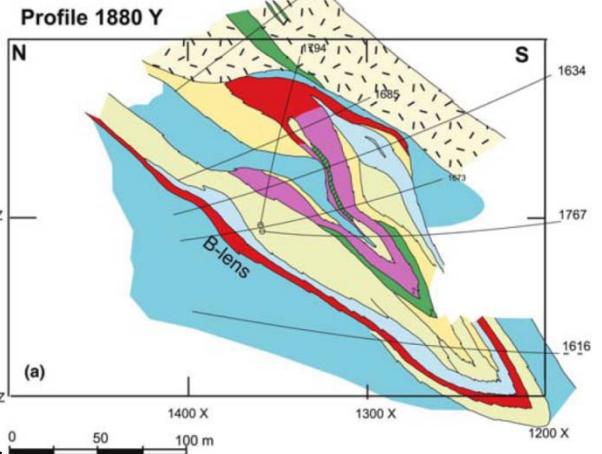
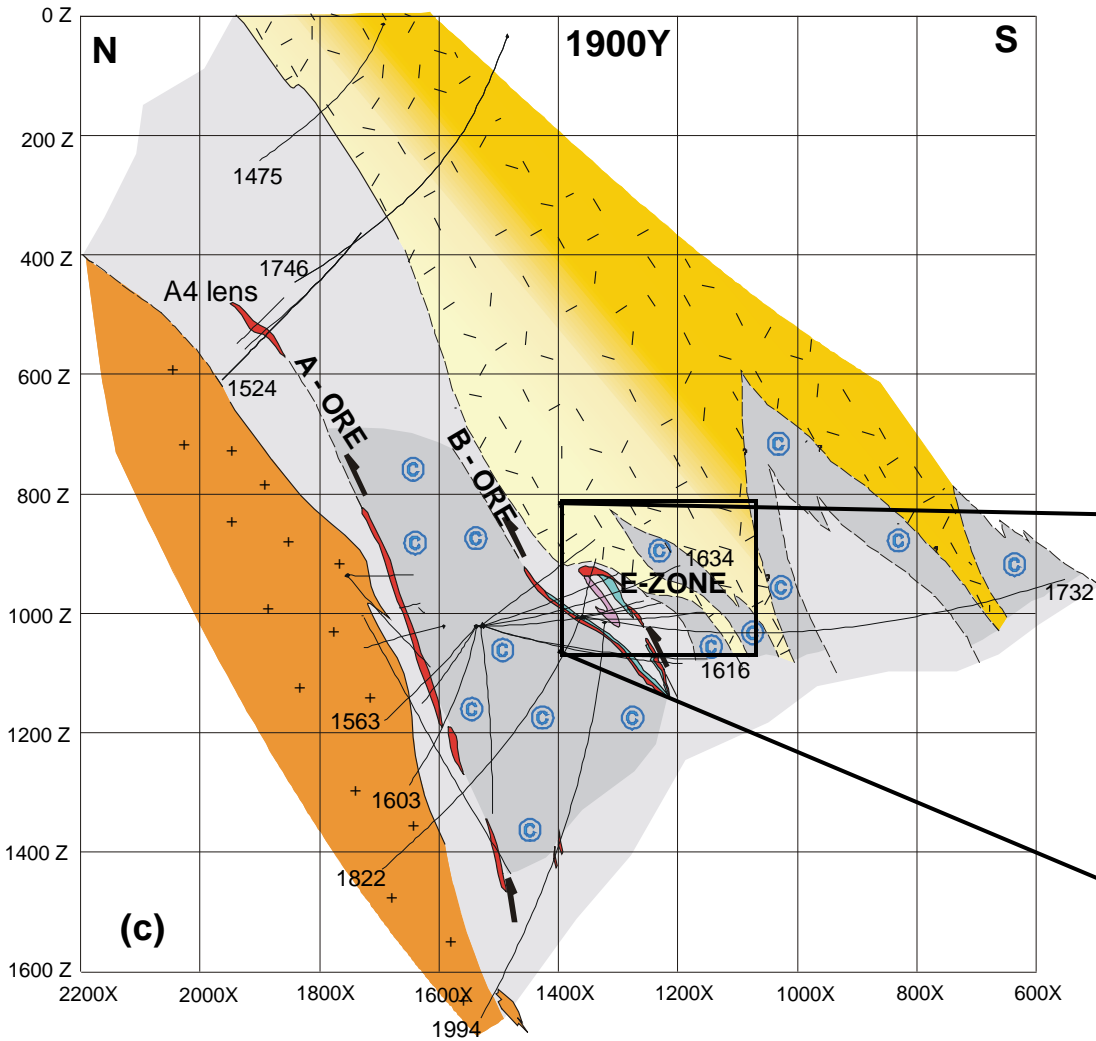
In the end of the day drilling is needed to test anomalies, verify models and delineation of mineral deposits

Zooming in to targets



# Exploration

How we work – Interpretation, geological modelling and deliniation

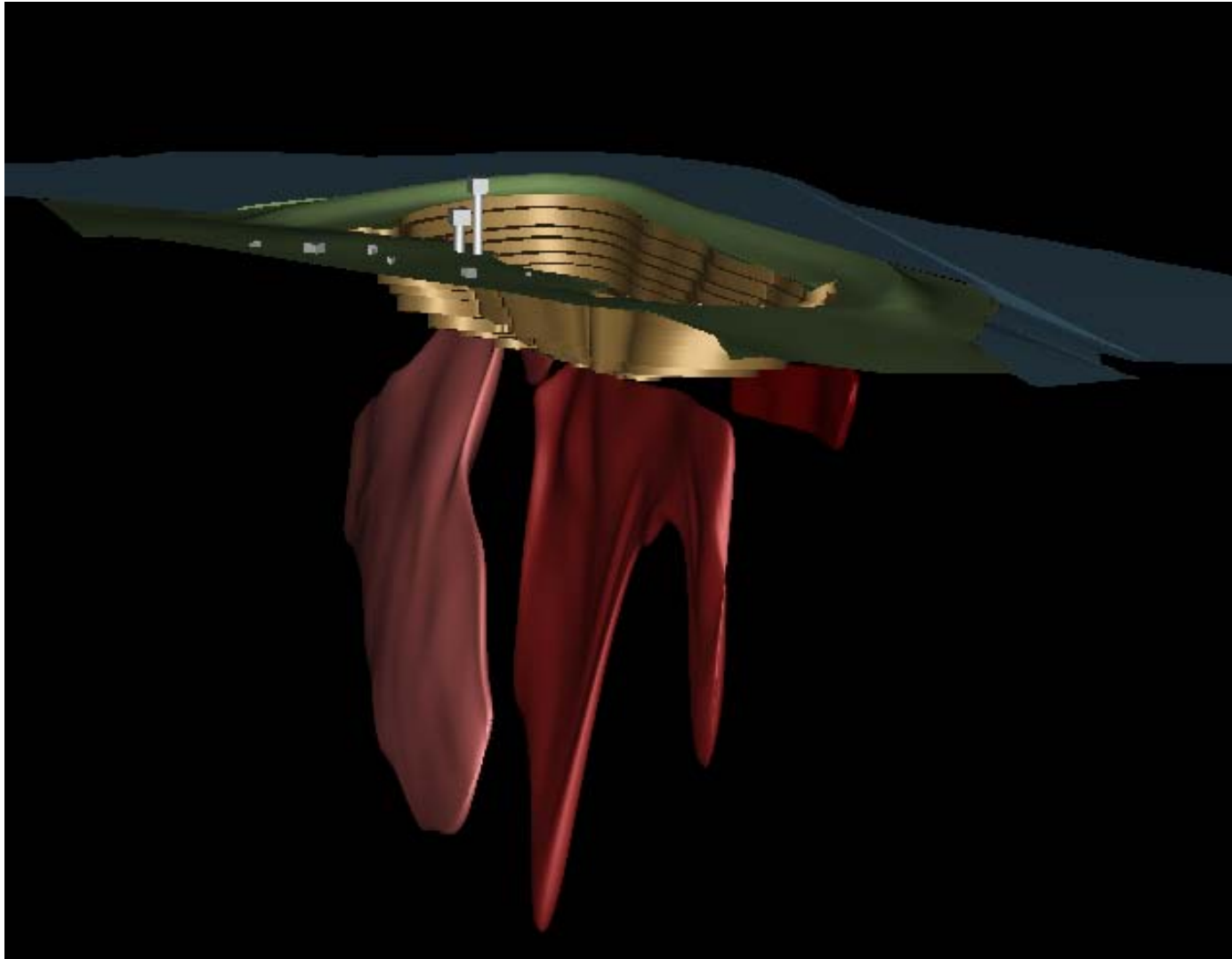


**BOLIDEN**



# Exploration

## How we work – 3D modelling and Resource Estimation



**BOLIDEN**

# Exploration

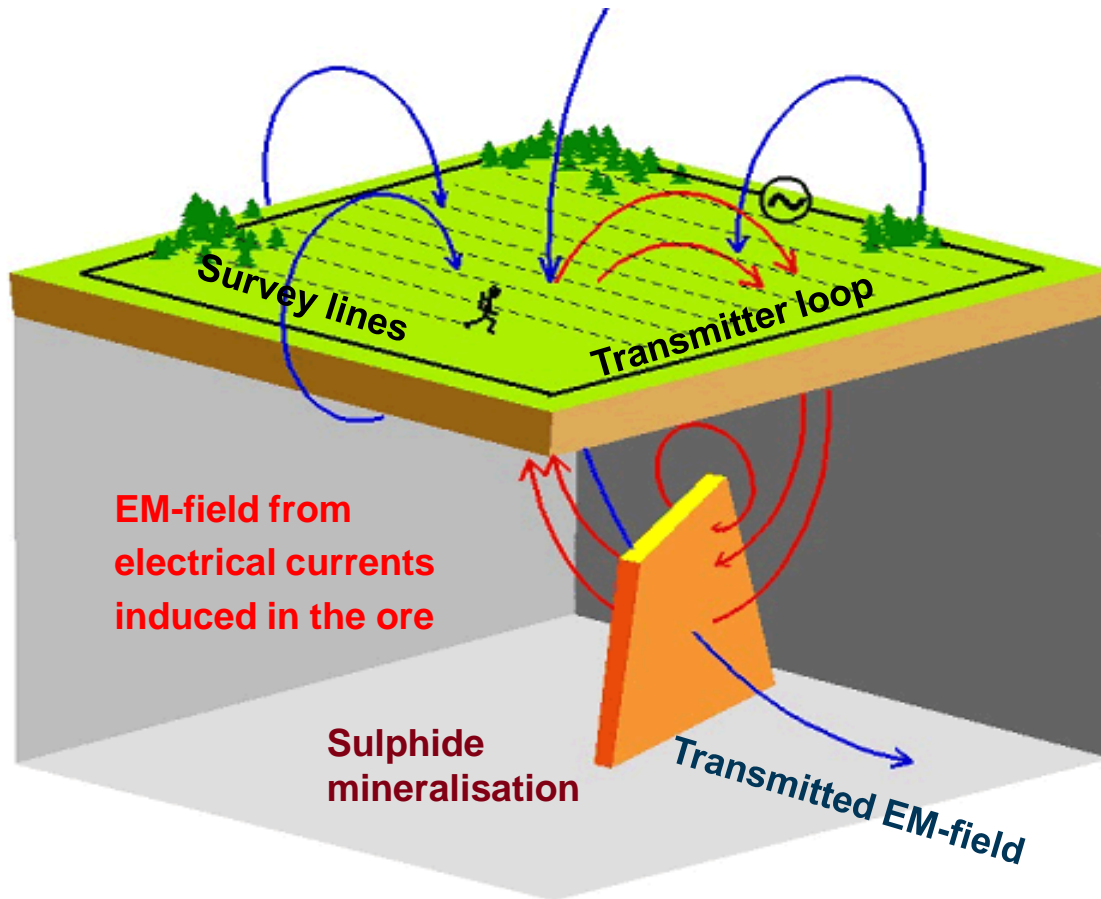
## Geophysical R&D

### Long tradition of R&D Geophysical instruments used and **developed** by Boliden

|      |  |      |   |
|------|--|------|---|
| 1918 | Equipotential method                   | 1986 | BHIP Downhole-IP                          |
| 1923 | Two-frame method                       | 1990 | Scintrex Gravimeter CG3                   |
| 1936 | Boliden gravimeter                     | 1990 | Ground Penetrating Radar                  |
| 1945 | Slingram (HLEM) 3600Hz                 | 1992 | BHMAG Downhole 3-comp MAG                 |
| 1950 | Airborne EM - and magnetic survey      | 1995 | EM3 Ground-EM 3-comp with GPS             |
| 1950 | Worden gravimeter                      | 1995 | Downhole 3-comp MAG on drillrod           |
| 1969 | Hetona Downhole 3-comp MAG             | 1996 | Downhole 3-comp EM on drillrod            |
| 1970 | VLF-E E-field 30 kHz local transmitter | 1998 | GEM Magnetometers GSM-19                  |
| 1970 | IP Induced polarisation                | 1999 | Downhole 3-comp EM/MAG on drillrod        |
| 1980 | <u>BHEM Downhole 3-comp EM</u>         | 2002 | <u>EM3-4 frequencies GPS-synchronized</u> |
| 1980 | TEM Transient-EM                       | 2003 | IP GPS-synchronized ground system         |
| 1980 | Airborne MEM                           | 2004 | 4 frequency downhole 3-comp EM            |
| 1980 | Downhole Radar                         | 2004 | MAG Ground magnetic instrument (GPS)      |
| 1984 | MAG Magnetic method                    | 2009 | Scintrex Gravimeter CG5                   |
| 1986 | EM3 Ground-EM 3-comp                   | 2010 | Portable IP-transmitter (GPS)             |

# Exploration

## Geophysical R&D – Electromagnetic survey Boliden EM3-4

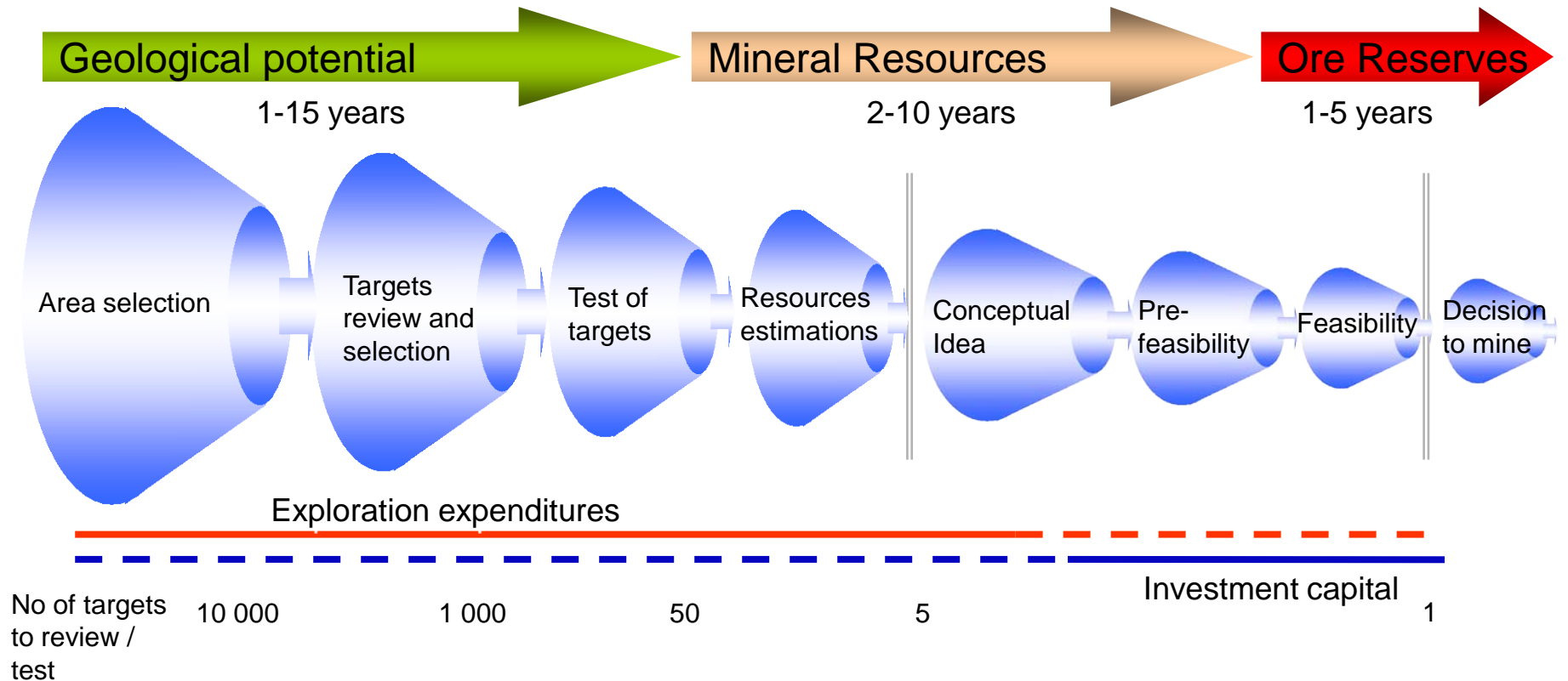


In Kristineberg Boliden have been able to detect ore bodies as deep as >1000 m by our electromagnetic surveys



# Exploration

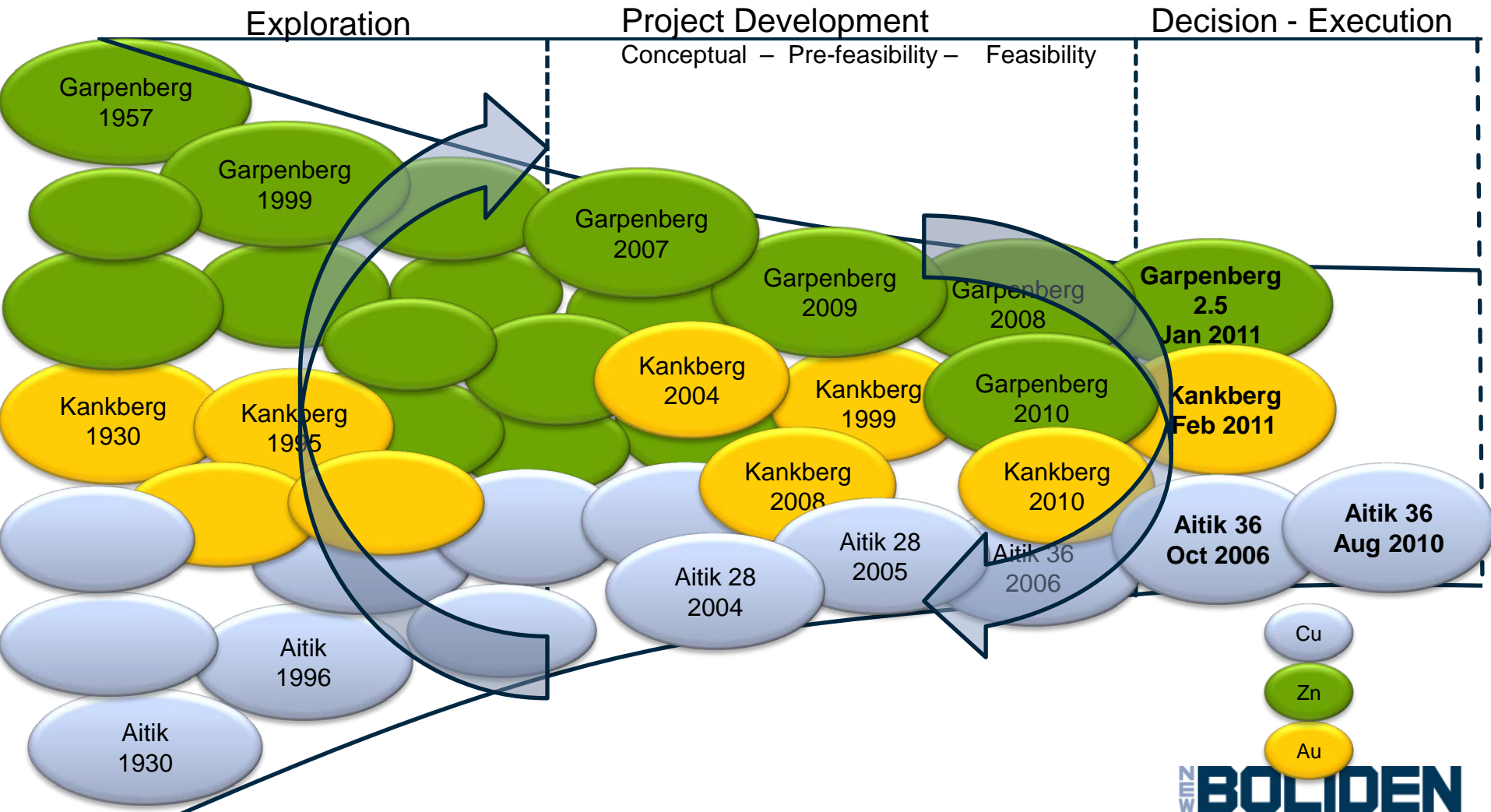
## From exploration to production – Long term strategy



# Exploration

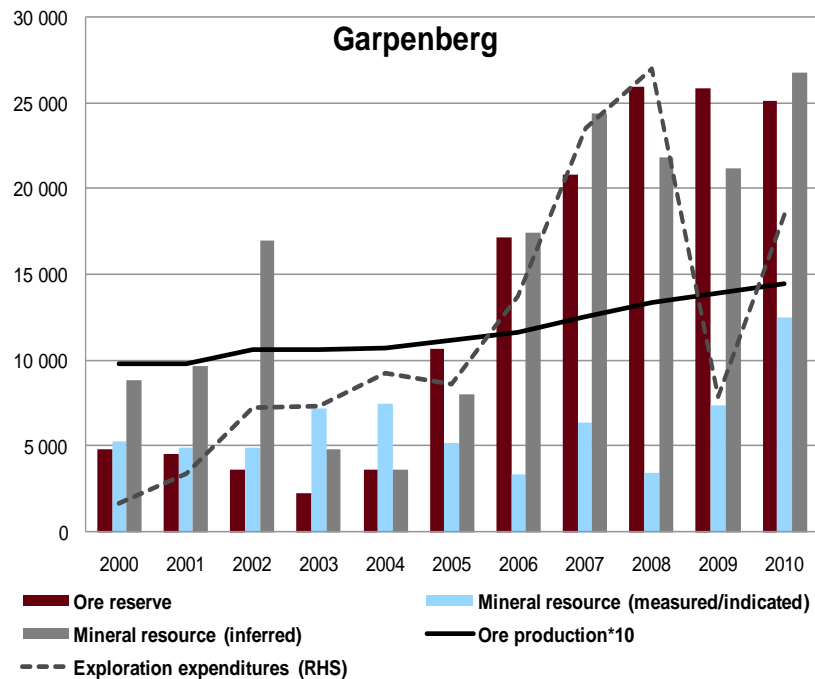
## Organic growth

Projects may loop, may be rejected or may be executed due to market conditions and project conditions

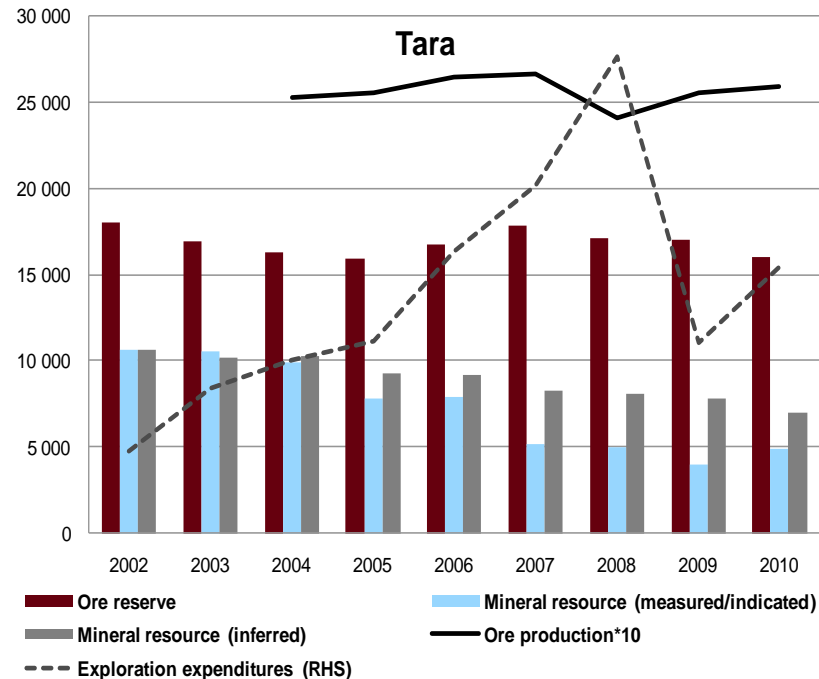


# Exploration

## Mineral Resources and Ore Reserves 2000-2010



- Mineral resources increased by 38%

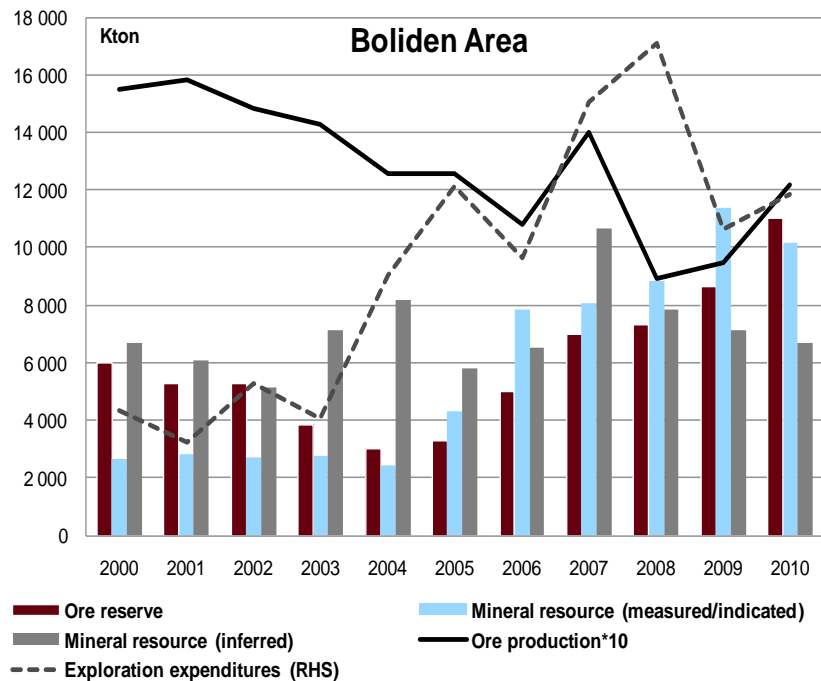


- Mineral resources unchanged
- Ore reserves slightly reduced

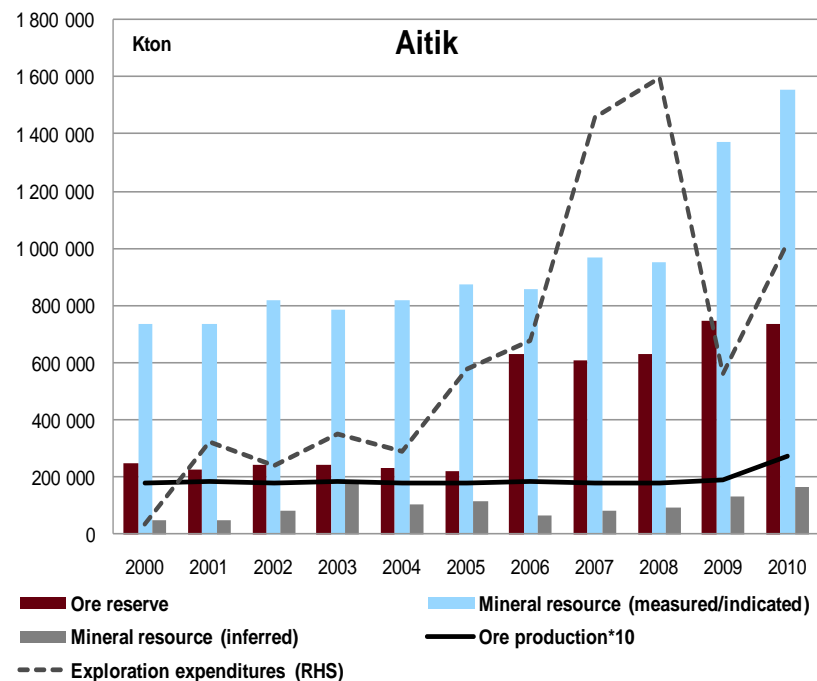


# Exploration

## Mineral Resources and Ore Reserves 2000-2010



■ Ore reserves grew by 29%



■ Mineral resources increased by 14%



