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Title: Data Acquisition and Processing - Helicopter Geophysical Survey at Valle, Setesdal				
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County: Vest-Agder, Aust-Agder		Commune:		
Map-sheet name (M=1:250.000) Sauda		Map-sheet no. and -name (M=1:50.000) 1413 I Urdenosi, 1413 II Valle, 1513 III Grøssæ		
Deposit name and grid-reference:		Number of pages: 8 Price (NOK): 40,- Map enclosures: 14 (Price: 30 NOK per map)		
Fieldwork carried out: June 2002	Date of report: 5.12.2002	Project no.: 2990.00	Person responsible: 	
Summary:				
<p>In June 2002, a helicopter geophysical survey was carried out over two areas at Valle, Setesdalen. The areas are named Rotemo and Rysstad-Straumsfjord. The purpose of the surveys was to provide geophysical information for mineral exploration. The data were collected and processed by the Geological Survey of Norway (NGU). A total of 526 line-km of magnetic and radiometric data were acquired using a nominal 200-m line spacing. The nominal flying height was 45 m above ground level (AGL), and lines were flown in alternating directions at headings of South and North at Rysstad-Straumsfjord, and northwest and southeast at Rotemo. Measurement noise levels were within survey specifications.</p> <p>Initial processing was carried out on a flight-by-flight basis. Total magnetic field measurements were collected using a cesium vapor magnetometer and corrected by removing diurnal variations as recorded at a magnetic base station at Valle. Radiometric data were reduced using three-channel processing according to procedures recommended by the International Atomic Energy Association. All final processed data were gridded using 50-m square cells. Geophysical maps were produced at a scale of 1:50 000 and are considered as standalone products.</p> <p>This report describes the aspects of data acquisition and processing of the survey.</p>				
Keywords: Geofysikk (Geophysics)		Radiometri (Radiometrics)	Magnetometri (Magnetometry)	
		Databehandling (Data processing)	Fagrapport (Technical report)	

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Maps available for order from NGU

Scale: 1:50 000

Map 2002.098-01A:	Flight path, Rotemo
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Map 2002.098-02B:	Magnetic total field, Rysstad-Straumsfjord.
Map 2002.098-03A:	Magnetic vertical derivative, Rotemo.
Map 2002.098-03B:	Magnetic vertical derivative, Rysstad-Straumsfjord.
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Map 2002.098-04B:	Radiometric total count, Rysstad-Straumsfjord.
Map 2002.098-05A:	Radiometric potassium, ground conc., Rotemo
Map 2002.098-05B:	Radiometric potassium, ground conc., Rysstad-Str.fjord.
Map 2002.098-06A:	Radiometric uranium, ground conc., Rotemo
Map 2002.098-06B:	Radiometric uranium, ground conc., Rysstad-Str.fjord.
Map 2002.098-07A:	Radiometric thorium, ground conc., Rotemo
Map 2002.098-07B:	Radiometric thorium, ground conc., Rysstad-Str.fjord.

1 INTRODUCTION

In June, 2002, a helicopter geophysical survey was carried out over two areas at Valle, Setesdal, Vest-Agder and Aust-Agder counties (see figures 1 and 2). The contractor was Valley Metals Exploration AS. The total area covered is 198 km² (87 km² at Rotemo and 111 km² at Rysstad-Straumsfjord) and the total distance flown was 526 line-km (134 line-km at Rotemo and 392 line-km at Rysstad-Straumsfjord). Magnetic and radiometric data were collected. The primary objective of the survey was to provide geophysical information to be used in gold prospecting in the area.



Figure 1: Survey area, Rotemo. Scale 1:75000

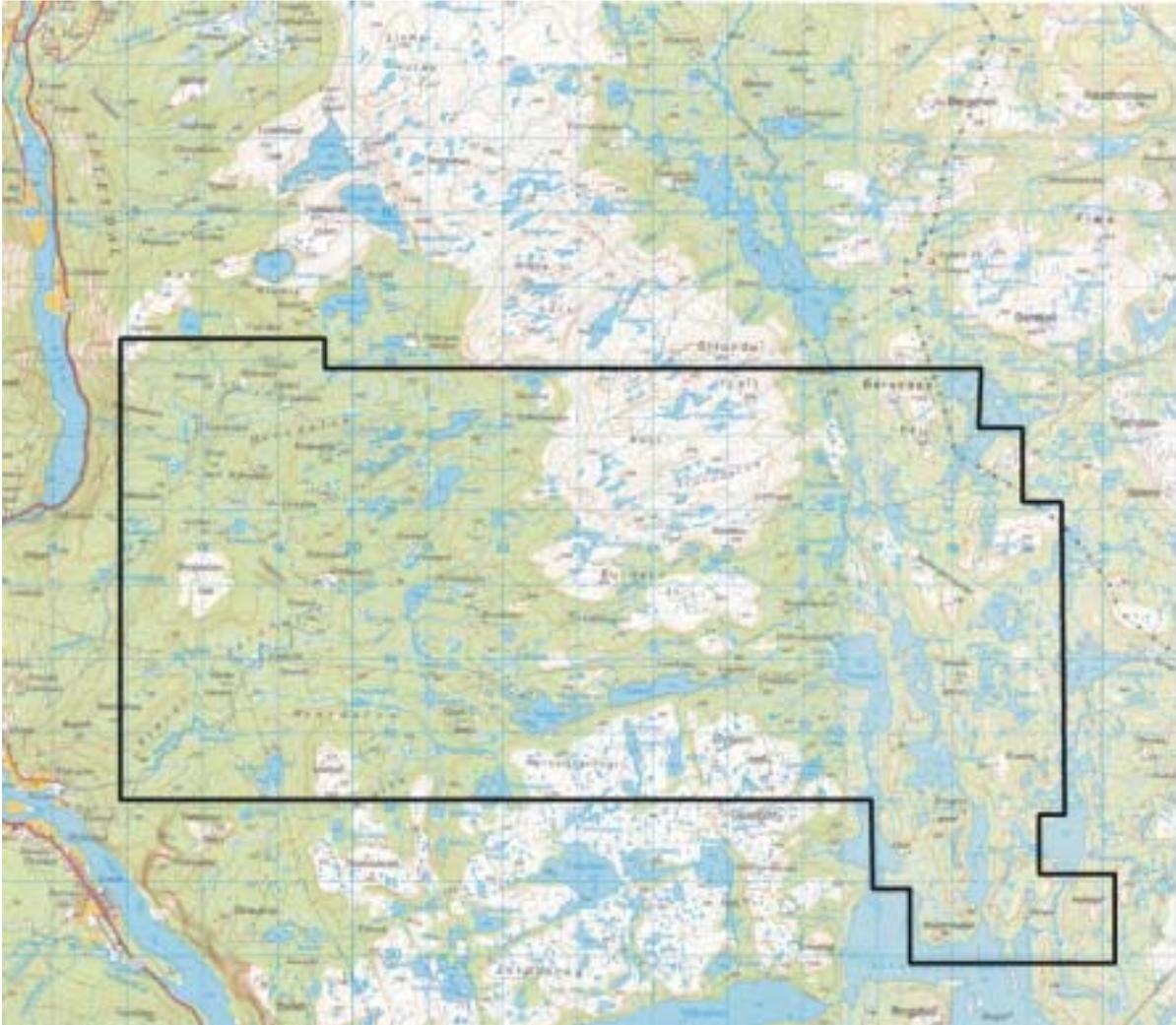


Figure 2: Survey area, Valle. Scale 1:100000

2 SURVEY PARAMETERS AND CONDITIONS

Strong wind can increase the noise level of airborne geophysical data. High winds were not frequent during the survey, but were encountered occasionally.

2.1 Magnetic data

Diurnal changes in the earth’s magnetic field affect magnetic data. The base station magnetic field never indicated strong magnetic storm conditions during the surveys. Magnetic data quality is excellent on all lines.

2.2 Radiometric data

Radiometric data can be negatively affected by atmospheric radon. However, in this survey radon contamination did not appear to be significant. The quality of the radiometric data is good.

3 DATA ACQUISITION

The survey aircraft was an Areospace Ecureuil SA 350 B-2 helicopter. Flying speed was approximately 100 km per hour (28 meters per second). Flight lines over the survey areas were in directions North and South at Rysstad-Straumfjord and northwest-southeast (45°-315°) at Rotemo with a flight line spacing of 200 m.

Senior engineer John Olav Mogaard was responsible for data acquisition and parts of the processing. Additional processing and map production were done by Eirik Mauring. At Rotemo, data were collected 6/6-2002, while data were collected 5/6-2002 at Rysstad-Straumfjord.

3.1 Magnetic measurements

A Scintrex CS-2 cesium vapor magnetometer was used. The magnetometer resolution is 0.01 nT. Sampling rate was 10 measurements per second (approximately 3 meter spacing). The magnetic sensor was towed approximately 30 metres above the ground, 15 metres below the helicopter.

A Scintrex MP-3 proton precession magnetometer was located at Valle, and was used for base station measurements. The base station magnetometer was synchronized with the helicopter-borne magnetometer to ensure proper removal of diurnal magnetic changes from the helicopter magnetic measurements. The magnetic total field at the base station was digitally recorded during flights at a rate of 15 measurements per minute.

3.2 Radiometric measurements

The radiometric system, purchased from Exploranium, Ltd. of Canada, consists of four sodium iodide (NaI) crystals (model GPX-1024-256) with a total volume of 1024 cubic inches (16.78 litres). The NaI crystals are coupled to a 256 channel Exploranium GR820 gamma ray spectrometer. Registration rate is one per second. An upward looking crystal was used in this survey, and can if desired be used to correct for airborne radon contamination. The crystal

package is mounted in a frame underneath the helicopter approximately 45 metres above the ground.

The spectrometer is an energy pulse height analyzer that sorts data into 256 channels according to energy magnitude. Every channel is 0.012 MeV wide. The full 256 channel spectrum was recorded. Windows constructed from selected groups of channels record the contributions of Potassium-40, Bismuth-214 (a daughter product of Uranium-238), and Thallium-208 (a daughter product of Thorium-232). These windows are labeled 'potassium', 'uranium', and 'thorium' respectively. A fourth window—the total count window—measures gamma ray energy between 0.4 MeV and 3 MeV.

3.3 Navigation, altimetry, and data logging

The navigation system used was an Ashtech G12, 12 channel receiver. Position accuracy using this system is better than 5 m.

The navigation console was a PNAV 2001 manufactured by the Picodas Group, Ltd. of Canada. Profile line data are entered into the console and the helicopter pilot can view the traces. The pilot can see his position with respect to these predefined lines and adjust accordingly.

The helicopter was equipped with a King KRA-430 radar altimeter that measured height above ground level, and was recorded digitally and displayed in front of the pilot. The altimeter is accurate to 5 percent of the true flying height.

The data logging system is an integral part of the Hummingbird electromagnetic system, manufactured by Geotech, Ltd. of Canada. Data was recorded both digitally and analog for quality inspection.

4 PROCESSING

The data were processed at the Geological Survey of Norway in Trondheim using Geosoft processing software (Geosoft, 1996) designed for NT operating systems. All maps were constructed from grids with a 50-m cell size. Obvious inaccuracies in navigation were manually removed from the data. The datum used for navigation was WGS84 and the projection was UTM zone 32.

Total field magnetic data: The data were inspected flight-by-flight and any cultural anomalies were identified and manually removed. A base station correction was applied to

each flight using corrections based on the diurnal measurements from the base station magnetometer at Valle.

Radiometric data: The Geosoft radiometric processing package (Geosoft, 1995) follows the window stripping processing procedure outlined in International Atomic Energy Agency Technical Report No. 323 (IAEA, 1991). A narrow nonlinear filter was applied to the radiometric data to remove spikes and a low pass filter was applied to smooth the data slightly prior to further processing. Background radiation levels were estimated by flying background calibration lines over water, usually two per flight, and by analyzing flight lines passing over lakes. After background reduction, the data were corrected for spectral overlap using experimentally determined stripping ratios. Atmospheric radon does not appear to have been a major source of data contamination in any of the flights. The processed data are presented as ground concentrations of Uranium, Potassium, and Thorium, and as ground level total counts.

5 MAPS PRODUCED

Maps were produced at scale 1:50 000. The geophysical data are displayed in the form of colour contour maps with a shaded relief effect. The shading (shadowing) effect is based on a light source in the northeast. The grid cell size for all maps was 50 meters.

A list of the 14 maps produced is shown on page 3 of this report. These maps can be ordered from the NGU either in digital form or as hard-copies.

6 REFERENCES

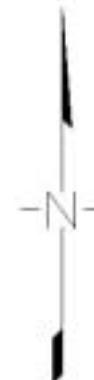
Geosoft Inc., 1995: OASIS Airborne Radiometric Processing System Version 1.0 User's Guide, *Geosoft Incorporated, Toronto*.

Geosoft Inc., 1996: OASIS montaj Version 4.0 User Guide, *Geosoft Incorporated, Toronto*.

IAEA, 1991: Airborne Gamma Ray Spectrometer Surveying, Technical Report 323, *International Atomic Energy Agency, Vienna*, 97 pp.



COORDINATE WITH
 CONFORM CYLINDRICAL PROJECTION
 Meters in UTM zone 18U coordinate, zone 18



NAVIGATION

The entire area was covered by GPS navigation.
 The nominal flying height above ground level in the area is 46 metres.

VALLEY METALS EXPLORATION AS

FLIGHT PATH

Rotemo, Setesdalen
 Aust-Agder

Drawing: Mogaard, J.O.	Date: JUN 2002	Obs: JOW
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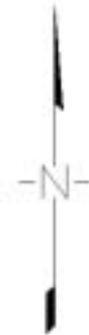
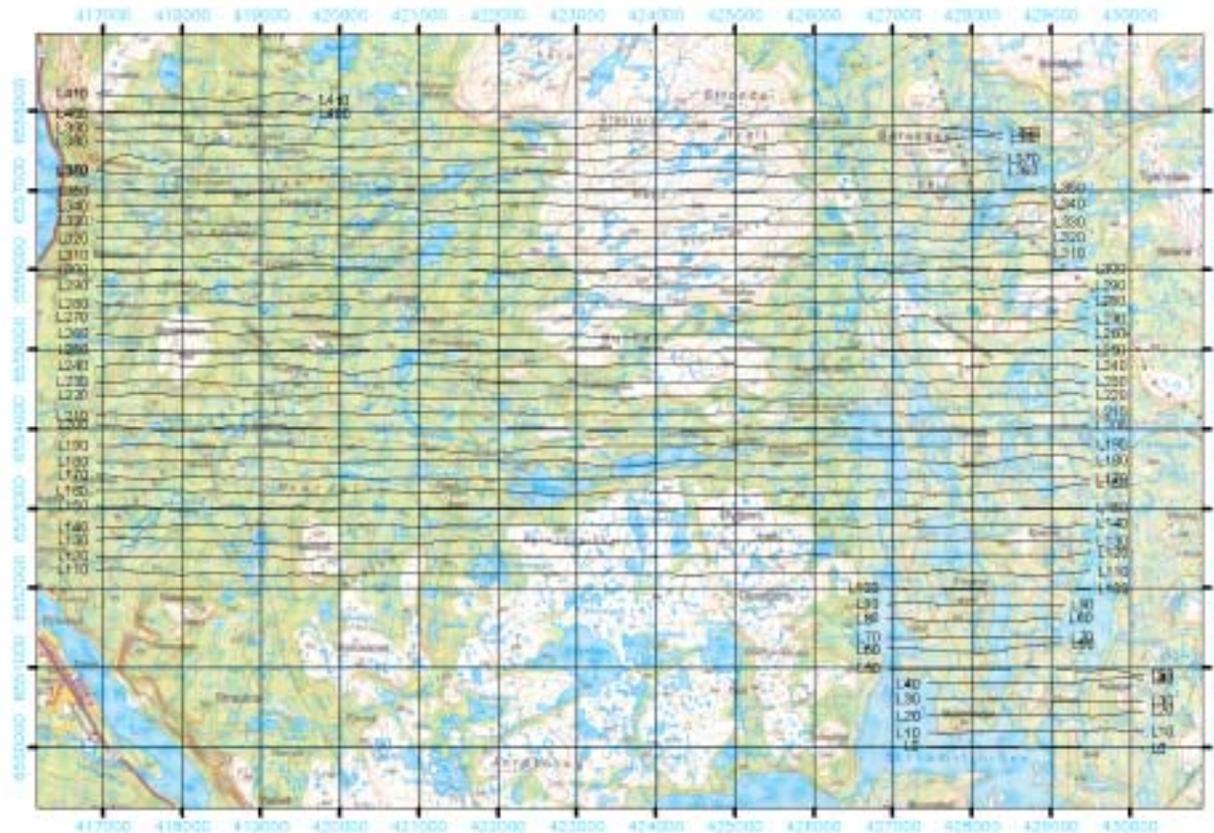


Mapsheet (1:50 000):
 5473 I Nord
 5473 I Unversal



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 http://www.ngu.no

Drawing no:
2002.098-01A



NAVIGATION

The air base was covered by GPS navigation.

The normal flight height above ground level in this area is 45 meters.

GEODETIC DATUM: WGS84
COORDINATE SYSTEM: UTM
Mapset: 4-101333-018 (1:50 000) © NGU

VALLEY METALS EXPLORATION AS

FLIGHT PATH

Straumsfjord, Setesdalen

Aust-Agder

Drawing: Mogaard J.O.	Date: JUN 2002	Obs: JOM
Scale: 1:50 000		Mapsheet (1:50 000): 4-101333-018
 (meters)		 (meters)

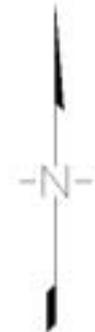
TOTAL MAGNETIC FIELD

The intensity of the total magnetic field is in nano Tesla.
Contours given in 5 nT intervals.



Colors - distributed after intervals.

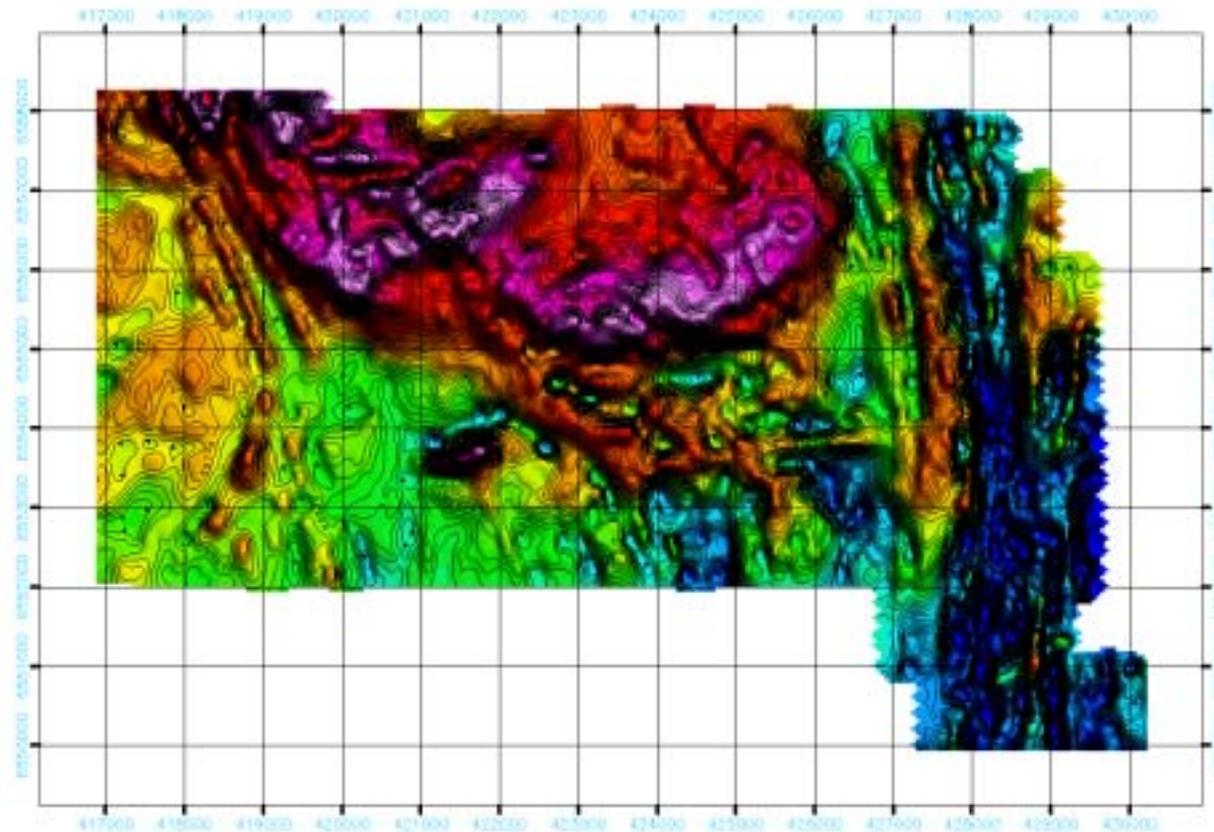
A high conductivity (sulphide mineral) zone was found at a central part of the area of 30 km².



NAVIGATION

The entire area was covered by GPS navigation.

The nominal flying height above ground level in the area is 40 meters.



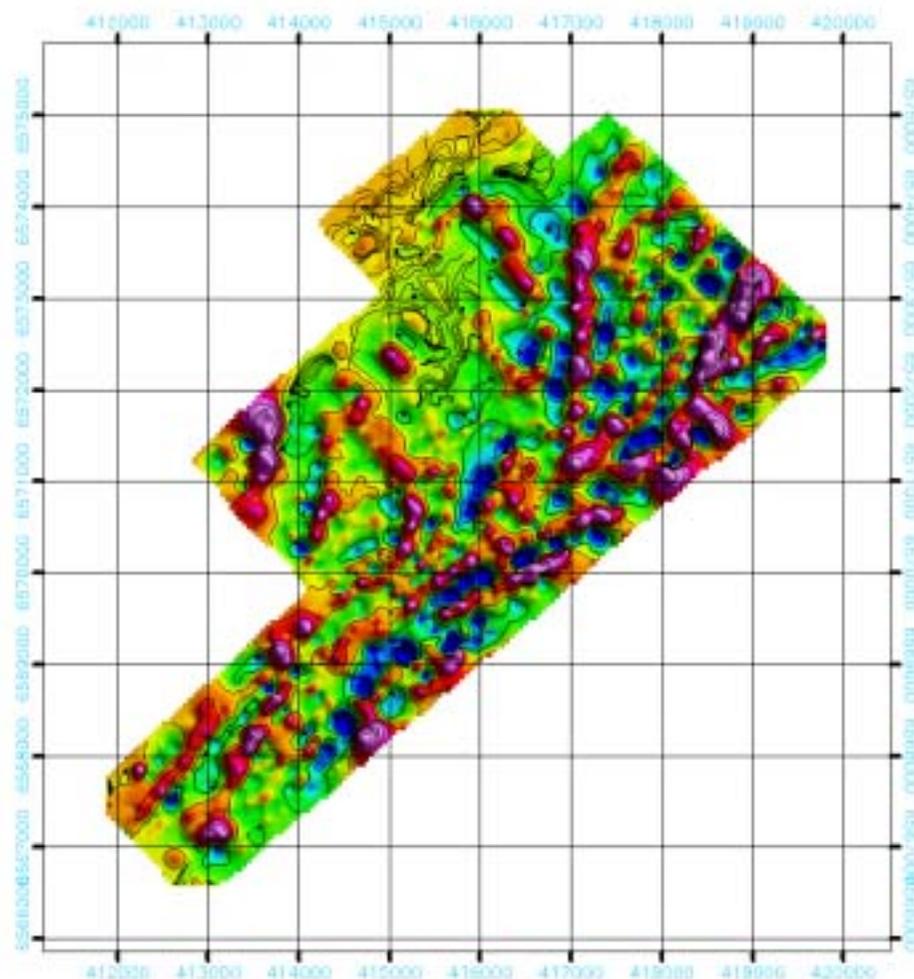
8 BIT RGB CMYK FROM
COPFORM COLORWORKS/ACTOBE
Rendered in EPS3 by ITM - v01.00, June 02

VALLEY METALS EXPLORATION AS

MAGNETIC TOTAL FIELD
Colours and contours

Straumsford, Selesdalen
Austhjørn

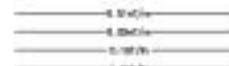
Drawing: Mogaard, J.O.	Date: JUN 2002	Obs: JOM
Scale: 1:50 000		Mapsheet (1:50 000): 473 of 506 553 of 606
		



0000003 ATOM 8998
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 Moduler & BLI 2020 17 00 00 00 00 00 00 00

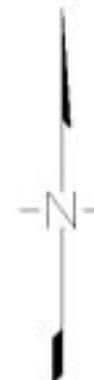
CALCULATED VERTICAL GRADIENT

Vertical magnetic gradient (in nanoTesla per metre)
 Calculated from the total field magnetic
 Contouring given following intervals:



Colours - distributed after colourcode.

Custom high sensitivity magnetic meter
 Sensor elevation - 35 metres.



NAVIGATION

The entire area was covered by GPS navigation.

The nominal flying height above ground level in the area is 45 metres.

VALLEY METALS EXPLORATION AS

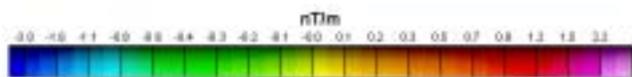
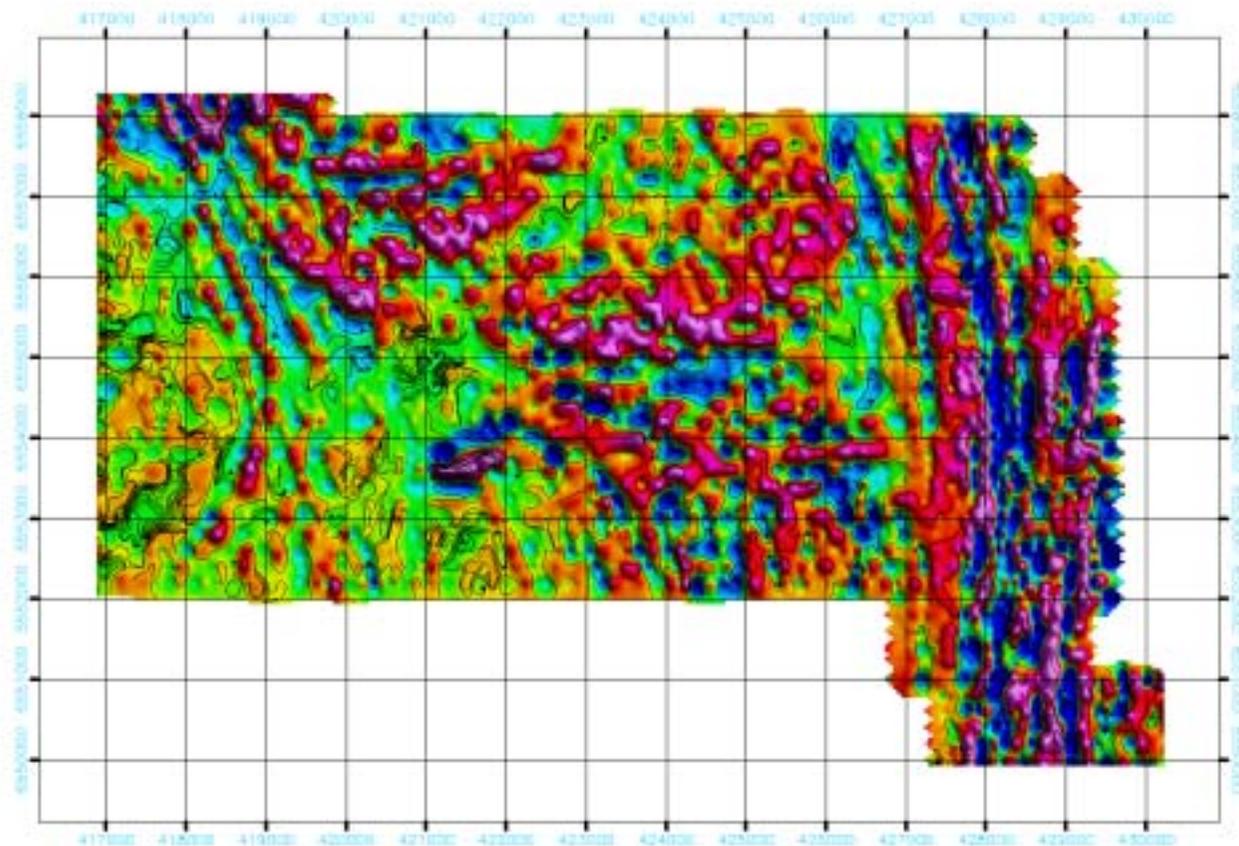
MAGNETIC VERTICAL DERIVATIVE Colours and contours

Rotemo, Setesdalen
 Aust-Agder

Drawing: Mogaard, J.O.	Date: JUN 2002	Obs: JOW
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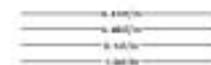
Mapsheet (1:50 000):
 5413 F Male
 5413 J Uncovered



ORGANISASJONEN
GEOLOGISKE TILFØRSLAG
Rapport nr. 511/02 (TSM) (vedlegg, side 3)

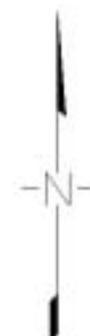
CALCULATED VERTICAL GRADIENT

Vertical Magnetic Gradient (in nanoTesla per metre)
Calculated from the total field magnetometry
Contours given in following intervals



Colours - distributed like contours

Colour high sensitivity magnetic field
Derivative interval - 30 nT/m



NAVIGATION

The entire area was covered by GPS navigation.

The normal flying height above ground level in this area is 60 metres.

VALLEY METALS EXPLORATION AS

MAGNETIC VERTICAL DERIVATIVE

Colours and contours

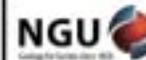
Straumstjørdalen, Setesdalen

Avst-Ågder

Drawing: Mjgeord, J.O.	Date: JULY 2002	DB: JOM
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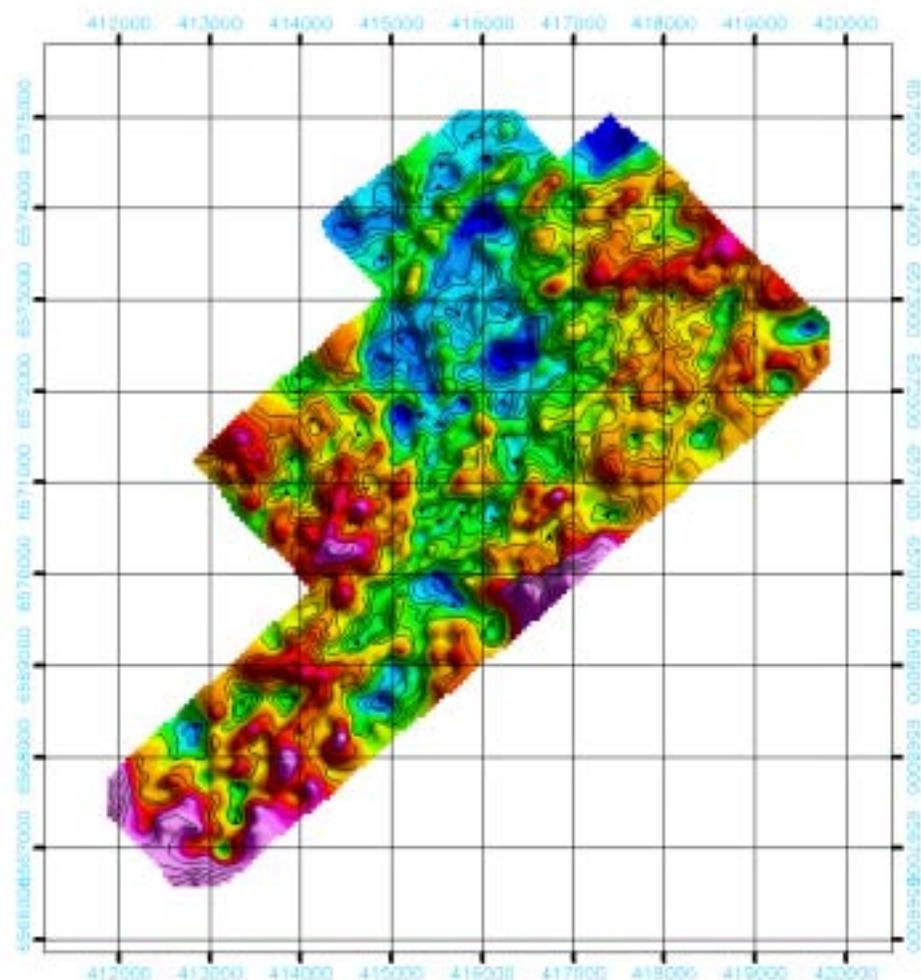


Mapsheet (1:50 000):
543 B Male
553 B Green



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Drawing no:
2002.098-03B



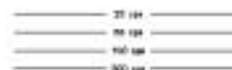
0000000-ATEM-87004
 CONVERSION CYLINDRICAL COORDINATE
 Method is MERSIS UTM coordinate, zone 32



RADIOMETRIC TOTAL COUNTS

Radiometric Total Counts (in counts per second)

Contours given in following intervals:



Colours - distributed after contours.

Data have been downward continued to ground level.



NAVIGATION

The entire area has been covered by GPS navigation.

The nominal flying height above ground level in the area is 45 metres.

VALLEY METALS EXPLORATION AS

RADIOMETRIC TOTAL COUNT
 Colours and contours

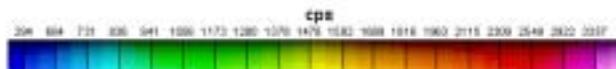
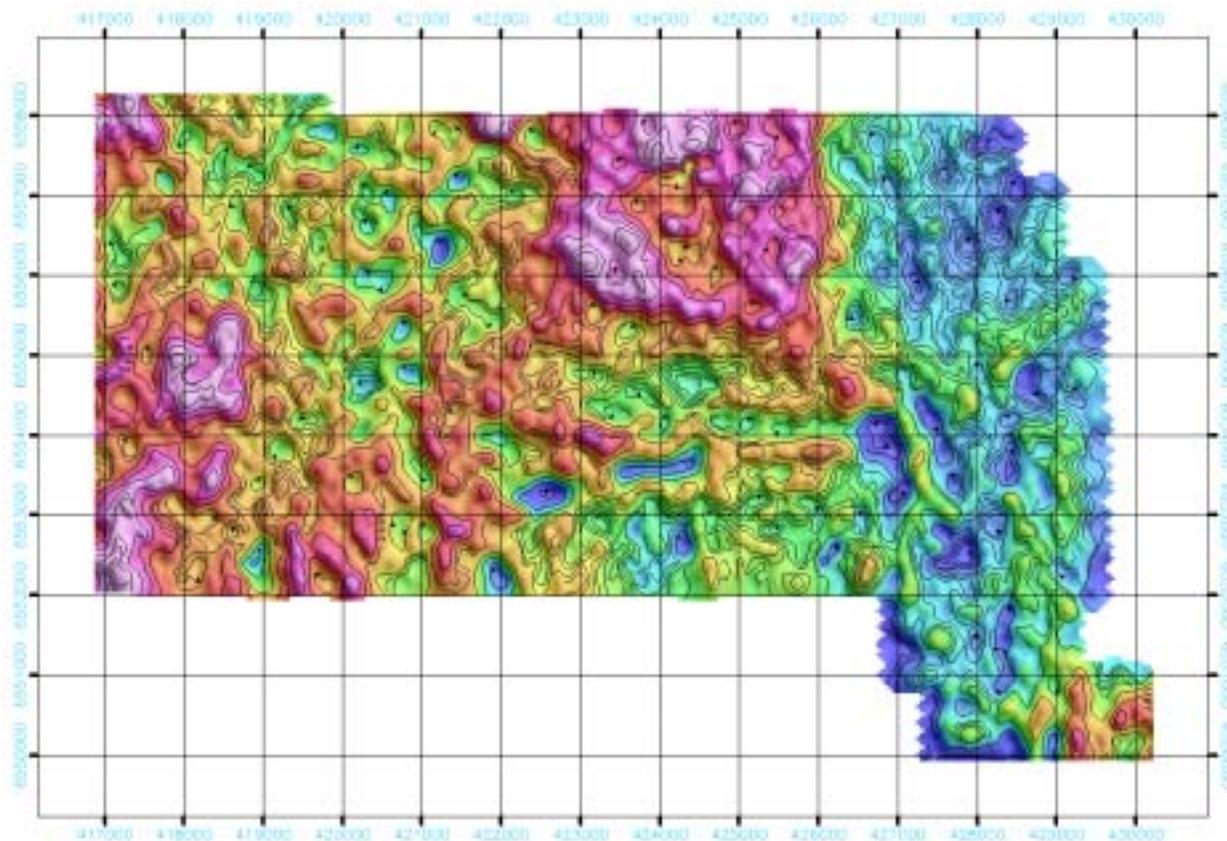
Rotemo, Setesdalen
 Aust-Agder

Drawing: Mogaard, J.O.	Date: JUN 2002	Obs: JOW
Scale 1:50 000 (in metres)		Mapsheet (1:50 000): 5403 F Iade 5403 J Undevor I



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Drawing no:
2002.098-04A

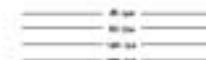


REG-EGC LAYERS 8/2004
 COMPARE CYLINDRICAL 8/2/2004
 Plotted in 8/1/2004 in TTM (1:500000, 4000 0)

RADIOMETRIC TOTAL COUNTS

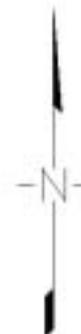
Map shows Total Counts (in counts per second)

Contours given in following table:



Contours - detailed at other scales

Data have been derived & contoured to ground level.



NAVIGATION

The data was collected by GPS navigation.

The normal flying height above ground level in this area is 28 metres.

VALLEY METALS EXPLORATION AS

RADIOMETRIC TOTAL COUNT
 Colours and contours

Straumfjord, Setesdalen
 Aust-Agder

Drawing: **Ølgaard, J.O.**

Date: **JUN 2002**

Obs: **JOM**

Scale 1:50 000



(metres)

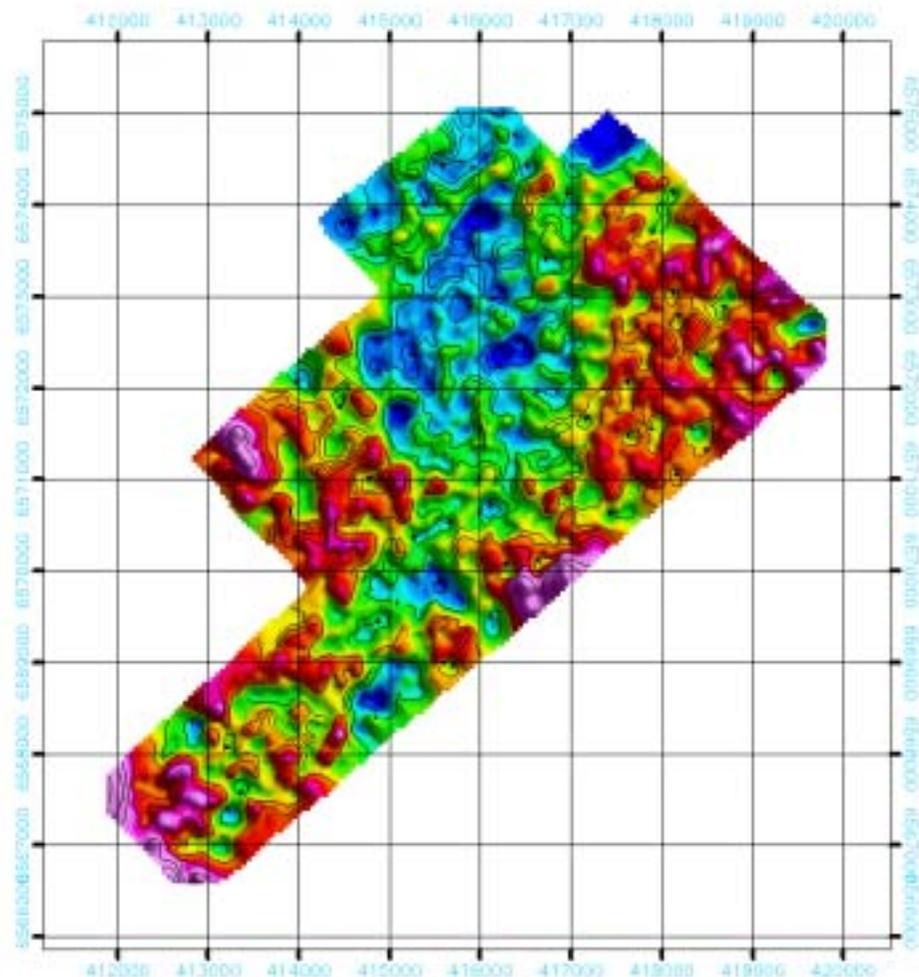
Mapsheet (1:50 000):
 543 & 544
 1513 of Geology



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Drawing no:

2002.098-04B



0000003 ATOM 8/19/04
 COORDINATE CYLINDRICAL PROJECTION
 UTM Zone 18N UTM 18N coordinate system, zone 18

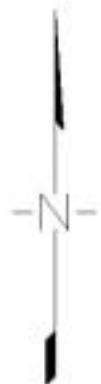


POTASSIUM

Potassium (in percent)
 Contours given in following intervals:

_____	0.99	_____
_____	1.15	_____
_____	1.61	_____
_____	1.99	_____

Colour - distributed after contours.
 Data have been downward continued to ground level.



NAVIGATION

The entire area was covered by GPS navigation.
 The nominal flying height above ground level in the area is 45 metres.

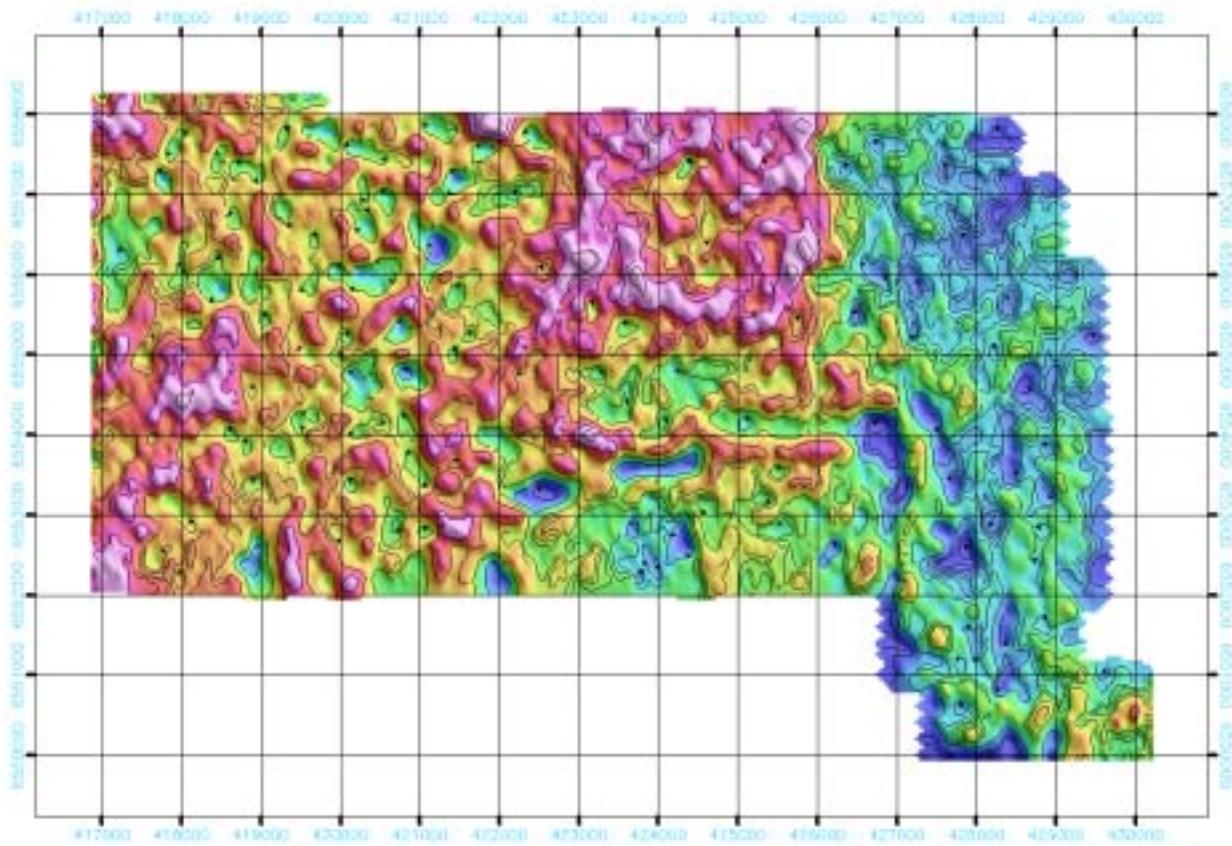
VALLEY METALS EXPLORATION AS

RADIOMETRIC POTASSIUM GROUND CONC.
Colours and contours

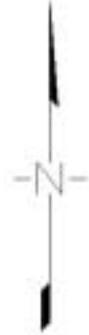
Rotemo, Setesdalen
 Aust-Agder

Drawing: Mogaard J.O.	Date: JUN 2002	Obs: JOW
Scale 1:50 000		Mapsheet (1:50 000): 5413 I Male 5413 J Uncovered
<p>(metres)</p>		

<p>NGU Geology for Society since 1858</p>	<p>GEOLOGICAL SURVEY OF NORWAY Geologisk institutt, Postboks 40 N-2007 TRONDHEIM Tel +47 73 30 40 11, Fax +47 73 32 56 23 http://www.ngu.no</p>	<p>Drawing no: 2002.098-05A</p>
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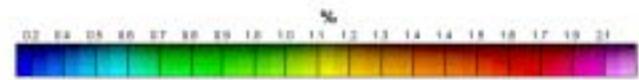
Colour - distributed after colouring
Data have been derived continued to ground level



NAVIGATION

The entire area has coverage of GPS navigation.
The normal flying height above ground level is the area of 100 m.

SEKS 8222 CARTON 8004
COPYING CYLINDER 0240 001 2004
Revised to 0.1.10 by VTM nordhav, rev. 20



VALLEY METALS EXPLORATION AS
RADIOMETRIC POTASSIUM GROUND CONC.
Colours and contours

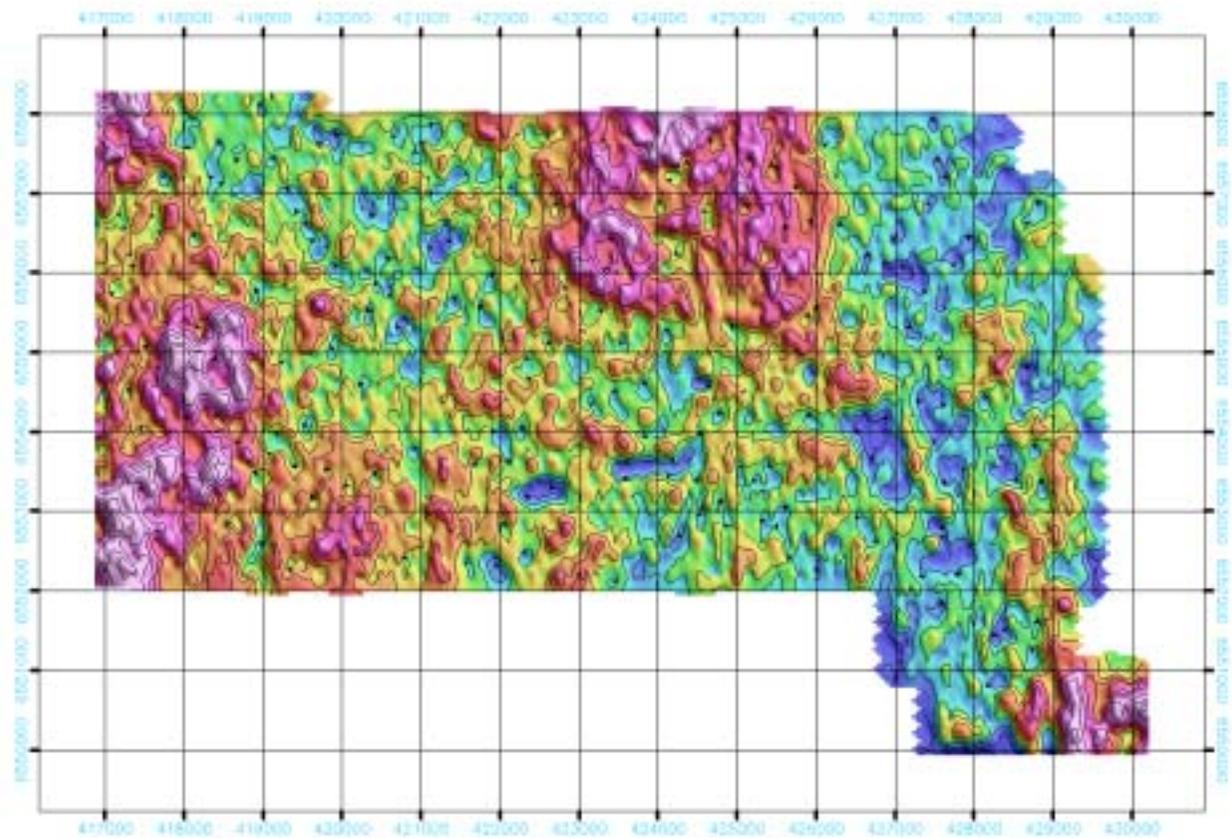
Straumfjord, Setesdalen
Aust-Agder

Drawing: Mogren/L.O.	Date: JUN 2002	Obs: JOM
Scale: 1:50 000		Mapsheet (1:50 000): M21 4 500 0511 05 0000
 (continued)		



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http://www.ngu.no

Drawing no:
2002.098-05B

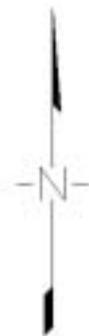


URANIUM

Equivalent uranium in ppm
Contours given in following table:

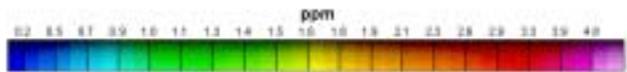
0.1 ppm
0.2 ppm
1 ppm
2 ppm

Colors - distributed after observations
Data have been downward continued to ground level



NAVIGATION

The entire area has accessibility of 0.0 navigation.
The contour height above ground level in the area is 0.0 meters.



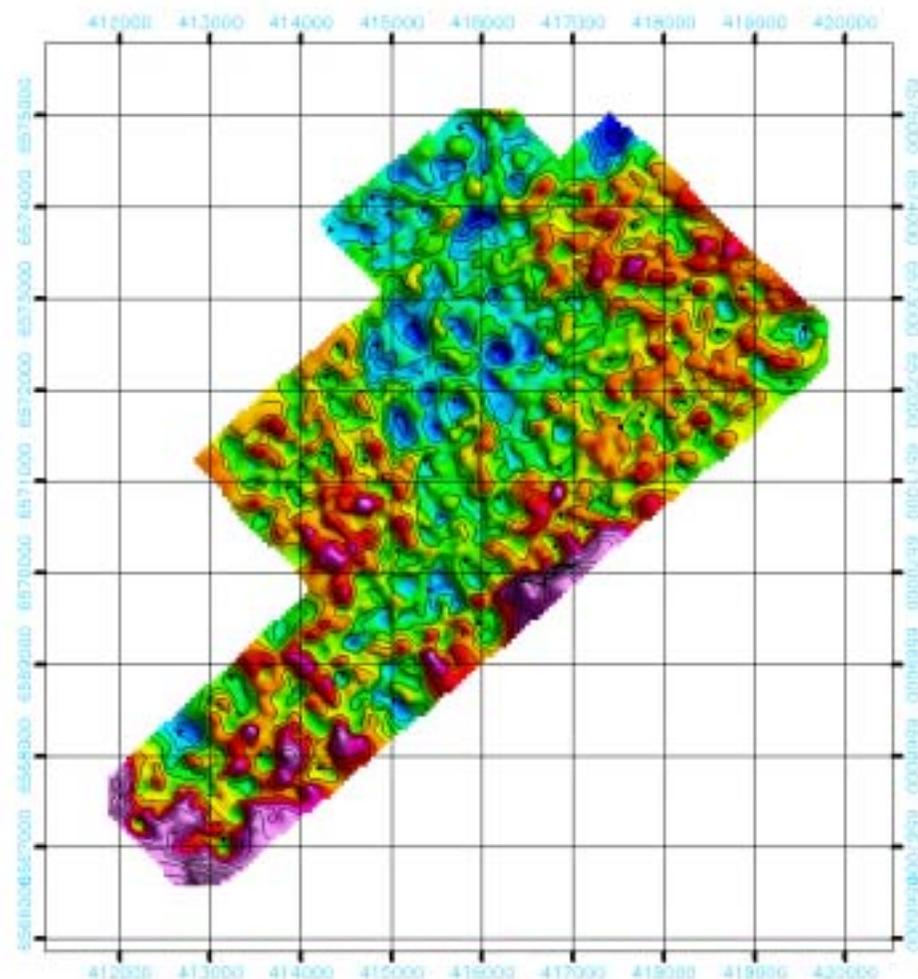
GEOLOGISK BYGG
GEOLOGISKE BILDETSKJEM
Målestokk 1:50 000, vers 11

VALLEY METALS EXPLORATION AS

RADIOMETRIC URANIUM GROUND CONC.
Colours and contours

Straumfjord, Setesdalen
Aust-Agder

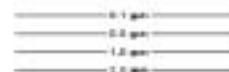
Drøying: Megard, J.D.	Date: JULY 2002	Obs: JDM
Scale 1:50 000		Mapsheet (1:50 000): 102.0 Udd 102.0 Udd
 (meters)		



0000003 ATOM 8938
 COGNOM CYLINDRISK SEKTOR
 Målestokk 1:50 000 i UTM koordinater, side 02

THORIUM

Equivalent Thorium (in ppm)
 Contours given in following intervals:



Colours - distributed after colour scale.
 Data has been downward continued to ground level.



NAVIGATION

The entire area was covered by GPS navigation.
 The nominal flying height above ground level in the area is 45 metres.

VALLEY METALS EXPLORATION AS

RADIOMETRIC THORIUM GROUND CONC. Colours and contours

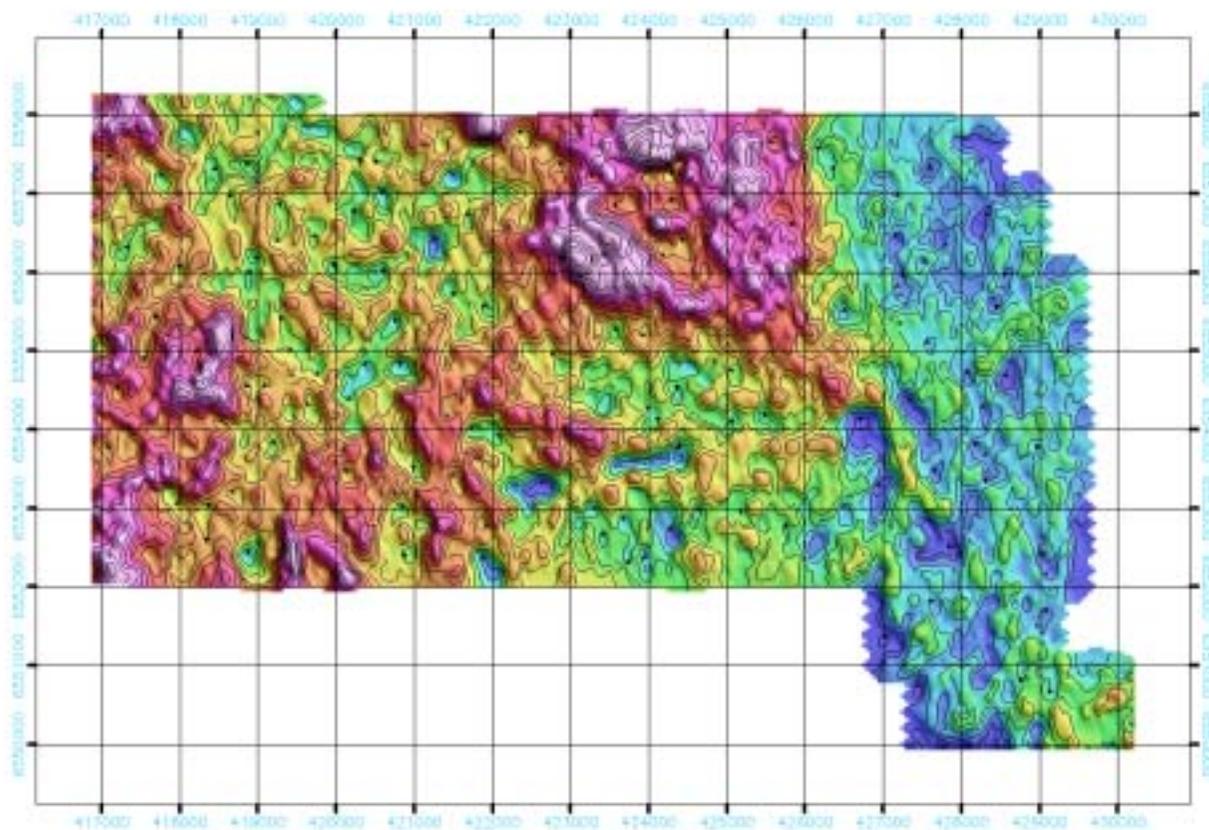
Rotemo, Setesdalen

Aust-Agder

Drawing: Mogaard, J.O. Date: JUN 2002 Obs: JOW



Mapsheet (1:50 000):
 5413 I Male
 5413 J Uncovered



THORIUM

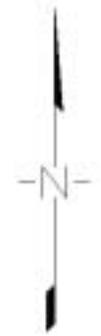
Skanned Thorium (ppm)

Contours given in following intervals:

- 0.1 ppm
- 0.2 ppm
- 0.4 ppm
- 0.8 ppm

Colours - data binned after contours.

0.8 has been downward continued to ground level.

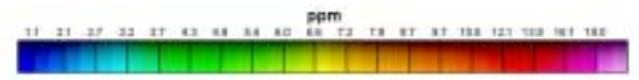


NAVIGATION

The entire area was covered by GPS navigation.

The nominal flying height above ground level in the area is 40 metres.

GEOTEKNIKTILGITT
 COPIFRAM CYLINDER (GCTC 30)
 (Skannet av EILSJE for GSD-metode, vers 3)



VALLEY METALS EXPLORATION AS

RADIOMETRIC THORIUM GROUND CONC.
Colours and contours

Straumstjor, Setesdalen
 Aust-Agder

Drawing: Afgaert J.O.	Date: JULY 2002	Drs: JOM
Scale: 1:50 000		Mapsheet (1:50 000): S42 E Valle 3013 W Oskedal
<p>(metres)</p>		

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Drawing no:
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