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BV 4006	1056/94		Trondheim	Fortrolig
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		Egil Livgard	Muting	

Tittel

Evaluation Report of Kells Creek Property, Oppdal, Norway

Forfatter	Dato	Bedrift
Egil Livgard	09.05 1994	Consolidated Logan Minees LTD Kjell Arve Isbrekken

Kommune	Fylke	Bergdistrikt	1: 50 000 kartblad	1: 250 000 kartblad
Oppdal	Sør-Trøndelag	Trondheimske	15194 15203	Røros

Fagområde	Dokument type	Forekomster
Geologi geofysikk	Rapport, plan	Gråurfjellet Kells creek
Råstofftype	Emneord	
Malm/metall	Au	

Sammendrag

Plandokument for sommerens (1994) arbeider.
I plandokumentet ingår flere detaljgeofysisk/geologiske kart med borhullsplassering samt et "structural and anomalies - index map" som alle kan ha stor generell interesse senere.

Se også BV 3975

Evaluation Report of

KELLS CREEK PROPERTY
Oppdal, Norway

Prepared for:
CONSOLIDATED LOGAN MINES LTD.

Prepared by:
Egil Livgard, P.Eng.
LIVGARD CONSULTANTS

May 9th, 1994

TABLE OF CONTENTS

INTRODUCTION

The writer acquired new topographic maps with a corrected UTM grid over the property from Norway's Kartverk. Parts of two maps were required. These were scaled up from 1:50,000 to 1:10,000. The resulting mylar was then screened back and overlain some of the coloured aerial geophysical maps (NGU Survey - Appendix). The resulting colour map then presented the aerial geophysical anomalies as they related to the topography. These maps will be used in the field to place diamond drill holes with maximum accuracy.

The topographic mylar was also used to plot mapped structures and aerial photo lineaments and other features. The geophysical anomalies were plotted on this anomaly map (Figure 7). Six areas of the anomaly map were scaled up to 1:5,000 and the proposed diamond drill holes were plotted on five of these (Figures 1 - 6).

WORK PROGRAM 1994 WITH COST ESTIMATE

1. Examine all (14) anomalous areas:

   A. Check the geology in all nearby outcrops - sketch map.

   B. Outline radiometric anomalies with scintillometer (use GPS for locating).

   C. Prospect for mineralized float; sample; quick return assays.

   D. Hand trench where mineralization is located or radiometric anomaly is well defined and where overburden seems reasonably shallow.

   Cost of preparation: three people - two weeks;
   one helicopter trip with camp and supplies $15,000

2. Diamond drilling

1,500 metres @ \$80/m (1.00KR = \$0.20 Cdn.)	
includes mob, demob, and moves between holes	\$ 120,000
G.S.T. & P.S.T. taxes @ 20%	24,000
Helicopter (moves and support)	27,000
Supervision: core logging, core splitting, sampling, sample preparation	30,000
Freight, equipment rental, local travel, supplies	5,000
Assaying - 200 samples @ \$20	4,000
Report and maps	6,000
Travel and miscellaneous	12,000
Subtotal	228,000
Administrative Costs and Contingency @ 25%	57,000
TOTAL	\$ 285,000

STRUCTURES

The anomaly configuration which has emerged from the aerial and ground geophysical surveys is dominated by 6 or 7 structural features which have either been mapped on the ground, assumed based on aerial photos, or the area has not been mapped and their presence is indicated by anomalies only. These features are:

#1 An east-west striking structure at UTM 6930N is probably a fault. The trace consists, for the most part, of a square trench about 20 metres wide and 2 to 3 metres deep. No rock outcrop has been found within this trench. The rocks in the walls appear unaltered. Drag folding(?) indicating left-handed movement was mapped in one outcrop. The fault trace is 4.0 kilometres long on the property, and extends 1.0 kilometre east of the property, and 5.0 kilometres west of the property. The fault trace approximately follows UTM 6930N. The structure stands out on both aerial and the ground geophysical survey.

#2 300 to 500 metres north of the above main fault lies a similar weaker and shorter but parallel structure. The structure does not show up on the geophysical surveys.

#3 1,200 to 1,300 metres south of the main fault a parallel structure is assumed based on mapped geology and air photo lineaments. The structure is noted on the aerial VLF-EM survey and stands out on the ground VLF-EM and magnetic surveys.

#4 Some parallel lineaments and associated texture noted on the air photos was designated as Zone A. It was interpreted as a possible shear zone. The zone extends from the main Trond Tarn and southwesterly-northeasterly at 030° azimuth for about 2.0 kilometres. It is about 250 metres wide at Trond Tarn and widens to about 350 metres going southwest as interpreted on air photos. It may also extend further to the northeast, but that interpretation is based only on the straight path taken by Trond River in this direction.

Zone A was examined on the ground. Very few outcrops were located but two outcrops (as assumed outcrops) were sampled. Sample #9664 came from an area southeast of, but near, Trond Tarn. Contorted mica-sericite schist and oxidized quartzose sandy gneiss was mapped and some copper staining was noted. The sample was selected and assayed (ICP) 0.49% Cu, 0.09% Pb, 0.01% Zn, 0.01% Sr, 68 ppb Au and 16.4 g/t Ag.

Sample #9673 as taken from a very similar outcrop, but without copper staining, about 1.0 kilometre southwest along the strike of the shear from the first sample. It assayed (ICP) 226 ppm Cu, low Pb Zn, 1.9 ppm Ag, and 10 ppb Au.

Four (only) ground survey lines cross the zone and give a 200-metre wide anomaly.

#5 1.5 kilometres northwest of Zone A, the aerial VLF-EM survey, Helgeland Station, outlined a 3.0 kilometre long anomaly which strikes nearly parallel to Zone A at azimuth

035°. This strong VLF-EM response shows the zone to be very different from Zone A which has no response.

#6 A small, 600-metre long anomaly lies parallel to but 500 metres southeast of the above anomaly. It covers an upper part of a creek which here flows northeasterly. The creek has made itself a wide and deep bed. It appears that the enclosing rocks are easily eroded.

#7 A major thrust fault has been mapped by NGU (Norway's Geological Survey). It strikes 140° azimuth and lies close to the eastern boundary of the claims. Its position on the north side of Trond River has been re-interpreted by the writer. The change in surface trace of the fault between the north and south facing slopes of Trond Valley gives northeasterly dip of 18°. The fault thrust Late Proterozoic gneisses over older Middle Proterozoic gneisses. The thrust fault trace can be seen on both aerial and ground VLF-EM as a positive response, weak going south from the 1A anomaly and strong going North, and on the aerial survey is a magnetic low response and a potassium and Bi 214 low response.

It should be noted that a thrust fault surface outcrop has never been seen either by Geological Survey mappers or by the writer. Its presence is inferred by "Techno-Stratigraphic Succession" (Krill N.G.U.). Air photo lineaments are believed to confirm its location.

ANOMALIES

On Structure #1:

Anomaly 1A (UTM 6930.1N, 524.7E)

The anomaly is located on the main fault (#1) where it intersects the thrust fault (#7). The main fault continues east but the anomaly does not. It is confined to the older gneisses. (A very weak anomaly indicates a possible offset continuation.)

It is a strong VLF-EM anomaly recorded by both Cutler, Main and Helgeland, Norway stations, indicating a three dimensional source. The anomaly extends approximately 700 metres east-west and 300 metres north-south. The fault intersection area also shows a slightly (10 gamma) higher magnetic response. The area is quite flat with a slight slope to the south near the crest of a broad ridge. No outcrops were noted in the vicinity. The overburden is rock rubble and sand from gneiss disintegration.

Anomaly 1B (UTM 6930N, 524.6E)

Moving along the main east-west fault, a small VLF-EM (Cutler) anomaly is located on the fault 1,700 metres west of the thrust fault. It is about 200 metres long.

Anomaly 1C (UTM 6929.9N, 524.35E)
Anomaly 1D (UTM 6929.7N, 524.075E)

These two anomalies are part of a generally anomalous radiometric area. 1C is the highest reading (Bi 214) in the radiometric survey. They are located south of but adjoining the main east-west fault. The anomalies may also be on an intersection with structure #4. There is substantial outcrop in the area. The rock types appear to be a granitic intrusive. Anomaly 1D extends above 100 metres eat-west next to Trond Lake.

Another radiometric anomaly about 200 metres to the north coincides with a body of coarse quartz K-feldspar with hematite.

Anomaly 1E (UTM 6929.9N, 523.5E)

This anomaly is a VLF-EM (Cutler) anomaly which straddles the main east-west fault and extends about 400 metres east-west. Its location corresponds to a point where the fault curves slightly to the northwest, then changes about 10-15° to the southwest. Adjoining this bend in the fault is a circular air photo feature which was interpreted as an intrusive plug. Ground examination tended to confirm this interpretation. The VLF-EM anomaly occupies the curved area of the fault where it adjoins the intrusive plug.

Anomaly 1F (UTM 6929.0N, 522.85E)

This is a radiometric nomaly which adjoins the main east-west fault on the south.

On Structure #2:

Anomaly 2A (UTM 6930.6N, 524.4E)

The anomaly lies at the junction of the east-west fault #2 (which is 300 - 500 metres north of the main fault and the thrust fault (#7). Its centre is located north and west of but adjoining the intersection point. This anomaly, unlike Anomaly 1A, extends both west and east of the thrust fault. Alteration was noted in the area such as muscovite-sericite schist and keratophyre. Coarse grained quartz K-feldspar float was abundant in the creek and in outcrops in the area as stringers and lenses. Extensive dioritic gneiss in the area is peppered with fine grained epidote.

On Structure #3:

The parallel east-west probable structure 1,200 to 1,300 metres south of the main zone has some anomalies associated with it as follows:

Anomaly 3A (UTM 6928.75N, 524.0 to 525.4E)

South of Kells Lake, a pronounced east-west lineation of contours, extending for 1,200 metres west from Kells Creek, is apparent on the aerial survey VLF-EM total field (line) map. This lineation is parallel to the main east-west fault about 1,300 metres to the north. The ground survey shows some interesting features in the same area. Just north of this line is a parallel zone of slight VLF-EM highs (Cutler dip angle, extending 0-100 metres north of the line). South of this line by about 75 metres is the axis of an east-west slightly elevated magnetic high response (5 gamma).

South of and down hill from this area, high grade (7.0 oz) gold mineralization has been located in square blocks.

On Structure #4:

The aerial photo interpretation outlined a possible shear designated Zone A (#4). This zone does not show up on the aerial survey. The ground geophysical survey was extended this way by four survey lines only. These four lines confirmed the existence of a 200-metre wide structure.

Anomaly 4A (UTM 6928.2N, 523.2E)

This anomaly is a combination of three responses: a high large area (200 metres by 400 metres) of magnetic response lying mainly (all?) outside the interpreted shear zone. The magnetic high and a lower extension is aligned along the east boundary of the "shear" zone. Within the "shear" zone, adjoining the magnetic anomaly and extending west of the survey area, is a radiometric anomaly (100 metres by 200 metres ++?). Adjoining the radiometric anomaly to the north and the magnetic anomaly to the west is a potassium anomaly which is 100 metres wide and 150 metres long in a westerly direction extending off the survey area. The area has not been examined.

Anomaly 4B (UTM 6928.9N, 523.6E)

This is a radiometric anomaly extending about 150 metres east-west and 60 metres north-south. There is a definitive magnetic high trend from Anomaly 4A to Anomaly 4B and a very weak potassium trend.

Anomaly 4C (UTM 6929.6N, 524.15E)

This anomaly constitutes the southwest trending part of radiometric Anomalies 1C and 1D, and includes a circular high at the south tip of the main Trond Lake. The last part of the anomaly is coincident with a small magnetic high. Some outcrops in the area consist of contorted mica-sericite schist, sandy quartzose gneiss with iron oxide, and very occasionally copper staining. The anomaly lies on the boundary of the interpreted southwest striking shear zone.

Anomalies Parallel to #4:

Anomaly 5 (UTM 6929.8N, 522.3E to 6932.0N, 523.8E)

This VLF-EM (Helgeland) anomaly lies in an area which has not been surveyed, mapped or prospected. The anomaly (Az. 035°) is in line with a geological contact and a series of ultrabasic lenses along that contact (Az. 045°) to the southwest. The most intense part of the anomaly is centred at UTM 6930.45N, 522.7E and the southern end of this intense central part coincides with a radiometric anomaly. A magnetic low anomaly coincides with the strongest part of the VLF-EM anomaly.

Anomaly 6 (UTM 6931.25N, 523.95E)

The anomaly (Az. 035°) extends over 600 metres along and north of a creek which is rapidly eroding the surrounding rocks. The area has not been surveyed, mapped or prospected.

On Structure #7:

North of Trond River, a very large and strong VLF-EM (Cutler) is designated 7A (centred on UTM 6931.3N, 524.55E).

The anomaly lies along the thrust fault and 50 metres to the east of it, and it bulges out to reach 250 metres west of the thrust fault. It extends 700 metres northwest uphill from Trond River, and a lower intensity lobe extends about 250 metres south of the river. The main part of the anomaly lies between two creeks, both of which may follow parallel traces of two thrust faults. The anomaly has no other geophysical expression, except perhaps very weak negative response in potassium and Bi 214 which may be due to overburden, and in magnetic response.

ANOMALY RATING

The anomaly evaluation is very uncertain and subjective. The ratings may be changed based on comments from NGU (awaiting) and almost certainly will be changed following ground examination (June, 1994) by radiometric check survey, geology, prospecting-sampling, and possibly trenching.

An evaluation list, starting with the anomaly most likely to have been caused by economic minerals, is as follows:

4A Radiometric anomaly (Bi 214), potassium and magnetic anomaly - geology.
3A Ground VLF-EM and magnetic, aerial VLF-EM (weak) - geology.
4B Radiometric anomaly (Bi 214) and ground VLF-EM anomaly - geology.
1A Aerial and ground VLF-EM anomalies (both stations) and magnetic anomaly - geology.
1E Aerial VLF-EM anomaly - geology.
7C Aerial VLF-EM anomaly - geology.

2A Aerial VLF-EM anomaly - geology.

4C Aerial radiometric - geology.

5 Aerial VLF-EM anomaly (Helgeland) and partly radiometric.

6 Aerial VLF-EM anomaly (Helgeland).

1C,1D Radiometric anomaly.

1F Radiometric anomaly.

1B Aerial and ground VLF-EM anomaly.

Radiometric anomaly over coarse quartz K-feldspar hematite body.

The anomaly rating is subject to changes dependent on awaited input from NGU and on the ground examination, mapping and surveying.

DIAMOND DRILL HOLES

Anomaly	Hole #	Depth (m)	Azimuth (0-360°)
4A	#1	150	340°
	#2	150	340°
3A	#3	100	180°
	#4	100	180°
4B	#5	150	340°
1A	#6	100	205°
	#7	150	15°
	#8	150	15°
1E	#9	150	360°
7C	#10	150	210°
	#11	150	210°
	11 holes	1,500 m	

Diamond drilling sequence should proceed as listed, however, changes may be done for several reasons:

- The preliminary ground work may change the anomaly rating.
- Heavy snowdrifts may still exist at some drill sites early in the season.
- The results of each hole may change the desired drill pattern of subsequent holes.
- When economic mineralization is encountered, drilling will focus on that area.

Respectfully submitted,

Egil Livgard, P.Eng.

REFERENCES

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Helicopter Survey over Graaurdfjellet, Sør Trøndelag, Norway.

E. Livgard, P.Eng., May 31st, 1993:

Oppdal Gold Property, Norway.

______, October 25th, 1993:

Report on the Kells Creek Property, Oppdal, Norway.

F.J.R. Syberg, August 1993:

Geophysical Survey Report on the Oppdal Property.

APPENDIX I

NGU REPORT 93.137, HELICOPTER SURVEY OVER GRÅURDFJELLET, SØR-TRØNDELAG, NORWAY

NGU Report 93.137

Helicopter Survey over
Gråurdfjellet,
Sør-Trøndelag, Norway

NGU
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REPORT

Report no. 93.137	ISSN 0800-3416	Grading: Confidential 12/2000

Title:
Helicopter Survey over Gråurdfjellet, Sør-Trøndelag, Norway

Author: John Olav Mogaard	Client: Consolidated Logan Mines Ltd.
County: Sør-Trøndelag	Commune: Oppdal
Map-sheet name (M=1:250.000) Røros	Map-sheet no. and name (M=1:50.000) 1520 III - Oppdal, 1519 IV - Snøhetta
Deposit name and grid-reference: Gråurdfjellet 32V 5240 69290	Number of pages: 13 Price: Map enclosures: 9

Fieldwork carried out:	Date of report:	Project no.:	Person responsible:
September 1993	December 1993	67.2611.00	Jan S. Rønning

Summary:
A helicopterborne geophysical survey was completed in a small area over Gråurdfjellet, south of Oppdal 26th of September 1993. The survey was commissioned by Consolidated Logan Mines Ltd. and constituted a part of gold and rare mineral exploration program. The total area surveyed covered approximately 16.8 square kilometers at a line spacing of 100 meters, for a total of approximately 168 line kilometers. The instrument package included a high sensitivity magnetometer, VLF and gamma-ray spectrometer. Results are presented as a series of colour geophysical maps.

Keywords:	VLF-måling	Gull
Geofysikk	Radiometri	Helikoptermålinger
Magnetometri		Fagrapport

TABLE OF CONTENTS

FIGURES

ENCLOSED MAPS

1 INTRODUCTION

A helicopterborne geophysical survey was undertaken by the Geological Survey of Norway (NGU) on behalf of Consolidated Logan Mines in a small area over Gråurdfjellet, Sør-Trøndelag, Norway. The survey was executed the 26th of September, 1993, and the whole area was covered in one flight. The area consisted nominally of a total of 168 line kilometers. Line spacing was nominally 100 meters at a flight elevation of 60 meters.
The survey constituted a part of a gold and rare mineral exploration program and the geophysical targets are to find/follow geological structures in bedrock.

This report describes the survey, data processing and presentation.

Survey area: The area was located in Norwegian M711-mapsheets number 1520 III, Oppdal and 1519 IV Snøhetta south of Oppdal. The location of the survey area is illustrated in figures 1 and 2.

Equipment: Equipment included an optically pumped magnetometer, a VLF-EM system, gamma-ray spectrometer, a video camera for flightline tracking, a radar altimeter and a GPS navigation system with base station for differential corrections. All data were recorded both in digital and in analogue form.

2 SURVEYING CONDITIONS

To obtain useful results during a helicopter survey several conditions have to be met. During the measurements several different factors can influence the data collected. In worst case the flight has to be canceled.

The weather conditions have to be within certain limits to produce good data. Rain and wind can produce noise levels above the specifications for the survey and usually this also creates problems for the navigation. Snow and hail-showers can be very dangerous to the equipment because of the possibility of charging the towbirds with static electricity.
The weather conditions during the flight over Gråurdfjellet was very good.

Because the survey was flown using GPS navigation the satellite constellation must be considered. This is found using a satellite almanac. Over Gråurdfjellet we tracked four satellites or more and had a 3-D coverage all the time.

The topography in the area has a certain influence of the measurements. In rough terrain it's difficult to keep exact speed and altitude. The area over Gråurdfjellet was very flat and well suited for helicopter measurements.

3 AIRCRAFT AND EQUIPMENT

The survey was flown using an Aerospatiale Ecureuil B-2 provided by Helikoptertjeneste A/S, based in Kinsarvik, Norway. Geophysical and ancilliary equipment was installed in the rear of the helicopter beside the operator. The sensors for magnetic and VLF measurements were towed by the helicopter and the cables were 15 and 10 meters long respectively. The crystal-package for the spectrometer was mounted on a frame beneath the helicopter. The videocamera was mounted on the same frame.

3.1 Magnetic measurements

Magnetometer: Magnetic measurements were made with a Scintrex MEP 410 split beam optically pumped magnetometer coupled to a digital signal processor. The cesium magnetometer has a high resolution (0.005 nT) and the sample rate can be up to 10 times per second. In the Gråurdfjellet area magnetic data was recorded five times per second. The sensor was towed approximately 15 meters below the helicopter. At an airspeed of approximately 30 meters per second this means that we are able to distinguish between anomaly reasons separated 15 - 20 meters apart at ground level.

Magnetic base station: Diurnal variations in the magnetic field were recorded with a Scintrex MP-3 magnetometer. Data were recorded digitally on a personal computer (Toshiba 3100e) and in analogue form on a thermal chart recorder (TOA EPR 121A). Clocks in the base station and the data acquisition system were synchronized prior to the flight to ensure correct removal of diurnal effects from the magnetic profile data.

3.2 VLF-EM measurements

VLF-EM measurements were made with a Herz Totem-2A VLF system. The system measures the field strength radiated from transmitters in the 15 to 30 kHz range which are operated by various national governments. The system provides total field and vertical quadrature measurements of the fields from two such stations. The sensor was towed in a bird located approximately 10 meters below the helicopter. To achieve a good coupling with conductors in the survey area transmitters should be selected so that the directions to the sites are approx. parallel (line) and orthogonal (ortho) to the flight direction. This is often a problem in Norway.

In the Gråurdfjellet area, station JXZ was used as the orthogonal channel while NAA was used as the inline channel. Sampling interval was 0.2 sec, (one sample every 6 meters).

Further pertinent information:

Abbreviation	Location	Frequency
JXZ	Helgeland,Norway	16.4 KHz.
NAA	Cutler, Maine	24.0 KHz.

3.3 Radiometric measurements

Radiometric measurements were recorded using a Geometrics gamma-ray spectrometer system. The system consists of:

1. Multichannel gamma-ray spectrometer, type GR800
2. Detector interface unit, type GR900
3. Crystal detector package, type DET 1024

The detector consists of 4 NaI crystals with a total volume of 1024 cubic inches (16.8 liters). Each crystal is glued to a photomultiplicator tube and there is a separate output of pulses from each PMT. The detector is continuously stabilized by a heater oven.

The detector interface unit consists of 4 summing amplifiers, high voltage unit for the PMT's, gain adjust control and heater oven control.

The spectrometer is a pulse height analyzer that sorts the summed pulse stream from the GR 900 into 256 channels of energy. Each channel has a bandwidth of 0.012 MeV in the energy spectrum. Three predefined windows are used to measure radiation from Potassium-40, Bismuth-214 (daugther of Uranium-238) and Thallium-208 (daugther of Thorium-232). An auxiliary window is defined to count the radiating Cesium from the Tsjernobyl accident. The total count between 0.4 MeV and 3 MeV are also recorded. Accumulation time was 1 second which gives a coverage on ground of approximately 120 x 150 meters pr. sample.

3.4 Navigation system

The navigation system consists of a Trimble SVeeSix 6-channel GPS receiver connected to a COMPAQ LTE Lite 4/25 laptop. The navigation software is delivered by Seatex, Norway. A navigation interface consol (with pilot's indicator and operator's keyboard) of type PNAV

2001 manufactured by Picodas Group Inc, Canada was connected to the laptop. Navigation data and GPS time are stored simultaneously on the laptop and in the data acquisition system. The profile lines are programmed into the PNAV and all the steering information is shown on the pilot's indicator (left, right, distance to go). The raw navigation data stored on the laptop are corrected using data received from a GPS basestation (differential GPS). The corrected data are then merged into the database containing the geophysical data by using the GPS time.

3.5 Data acquisition system

Data were acquired by a DAS-8 data acquisition system manufactured by RMS Instruments Ltd. Data were recorded both digitally on a 150 Mbyte tape (RMS-HDS150) and in real time with a thermal graphic printer (RMS-GR33). Digital data were subsequently transferred to a microVAX computer at NGU for processing and map production.

An integral part of the data acquisition system is the analogue recorder, which allows output of the system to be monitored in real time. The recorder operates at a chart speed of 1.5 mm/sec (about 1:20000 scale at a flight speed of 30 m/s). In addition to the analogue output of the magnetic data (100 nT and 1000 nT), four VLF channels, total count and uranium window from the spectrometer, digital time and GPS (X,Y) are also output. Lines running across the width of the chart indicate the position of a fiducial recorded by the navigator.

3.6 Flight path video

As a backup to the GPS navigation system, a video camera was mounted below the helicopter beside the spectrometer. Time and manual fiducials are superimposed on ground imagery to assist the correlation of the video with digitally recorded data. Video proved to be unnecessary for recovering the position of the aircraft.

3.7 Radar altimeter

A King KRA-10A radar altimeter was mounted in the helicopter to provide ground clearance information to an accuracy of 5%. The primary use of the radar altimeter as an aid for maintaining constant ground clearance.

4 FIELD OPERATIONS

The survey consisted of only one flight. Weather was clear and calm.
Details of various operations are listed below.

Flight path: The survey was flown only with GPS (differentially uncorrected during flight) navigation. Normally a combination of visual and GPS navigation are used but because of the nature of the area (very short lines and very little to use as a visual reference on ground) a navigator would have little value.
Flight direction was 326/146 degrees and line spacing was 100 meters. Flight path was reconstructed by applying differential corrections to the digitally recorded GPS data. Because the navigation system used uncorrected GPS data the reconstructed lines (the real lines) differs a bit from the ideal lines. The corrected GPS output used during postprocessing were in the WGS 84 projection.

Aircraft ground speed was approximately 60 knots (100 km/h) or about 30 meters/second. Aircraft location was controlled horizontally by GPS output. Vertical control was provided by a radar altimeter.

GPS Reference station: The GPS reference station was located in Trondheim approx. 120 km north of the survey area. The manufacturer of the navigation software have a station set up in their office and correction data are made available using a modem connected to a PC.

Magnetic basestation: A magnetic basestation was operated so diurnal changes in the magnetic field could be removed from magnetic profile data. The base station was located at NGU's office in Trondheim. The diurnal field was sampled every 4 seconds and was recorded both digitally for later data processing and in analog format to assist in quality control.

Spectrometer background lines: Background lines were flown before and after the flight over a lake near the survey area for a duration of approximately one minute.

From NGU participated:	Senior engineer John Olav Mogaard Engineer Oddvar Blokkum
From Helikoptertenest participated:	Pilot Ole Anders Listad

5 PROCESSING

Processing system: Data were processed on a microVAX 3100 using processing software acquired from Aerodat Ltd. of Toronto, Canada. Colour maps were produced on a Calcomp 58000 plotter at NGU.

Processing philosophy: Processed products were generated using minimal filtering, interpolation, blending of data between lines while gridding, and with minimal pruning of the data. Grids were filtered only to reduce the raggedness of the contoured product, and not to blend data between lines. Thus the maps produced reflect the quality of the data used to generate them, and not that of an idealized geophysical dataset.

Gridding: Contour and colour presentations were prepared from gridded profile data at a 25 meter grid cell spacing.

Total field magnetics: The magnetic data were subjected to spike rejection and light filtering to remove spikes from the data set without losing any vital information. Then the data are corrected for diurnal variations by using the data from the basemag. The two datasets are correlated by time using the clocks in the basestation and in the helicopter. During this process all data are normalized against a basevalue that reflects the normal total field on the site for the basemag. This is done to ensure that anomalies are caused by geological reasons and not by time dependent variations.
The magnetic data are then ready to be gridded.

Total magnetic field gradient: The total magnetic field vertical gradient map is prepared from the Hanning filtered total magnetic field grid using a 17 by 17 point vertical gradient filter. The resulting grid is then smoothed with a 5 by 5 point Hanning filter before contouring.

VLF: VLF in-line and orhogonal total field channels are processed using a spike rejection algorithm, and then Hanning filtered using a 9 point (1.8 sec) filter. The VLF data are then contoured and manually pruned to eliminated anomalies along line which could obviously have no geological origin. The data were re-gridded and filtered with a 5 by 5 point Hanning filter before contouring.

Radiometrics: The radiometric data are processed using a software package developed by Geometrics. Data are firstly corrected for deadtime (delay in the AD converter in the spectrometer) and the normalized to cps (counts per second). Then the background values for the different channel are subtracted. Background radiation is primarily caused by cosmic radiation but instruments and materials in the helicopter can contribute to increase the values. The background values are determined by flying over water at the start and at the end of a flight. All data are normalized to a height of 250 feet by using the radar altimeter before finally the data are corrected for the Compton Scatter effect.

6 PRODUCTS

Data are presented as colour contour maps at a scale of 1:10000. Normally cesium maps are not included. Because of the downfall from the Tsjernobyl accidence in 1986 it could be useful to see the effect from cesium while doing radiometric interpretation.

The following maps are produced for this report:

Map	**93.137-01**	**Magnetic total field**
Map	**93.137-02**	**Calculated Vertical Magnetic Gradient**
Map	**93.137-03**	**VLF-EM Total field (LINE)**
Map	**93.137-04**	**VLF-EM Total field (ORTHO)**
Map	**93.137-05**	**Radiometric Total Radiation (cps)**
Map	**93.137-06**	**Uranium (Bi214) Radiation (cps)**
Map	**93.137-07**	**Thorium (Ti208) Radiation (cps)**
Map	**93.137-08**	**Potassium (K40) Radiation (cps)**
Map	**93.137-09**	**Cesium (Cs137) Radiation (cps)**

Additional copies of these maps are available from NGU on request. To obtain additional maps, quote processing job number 9305.

Figure 1. Location of site within Norway

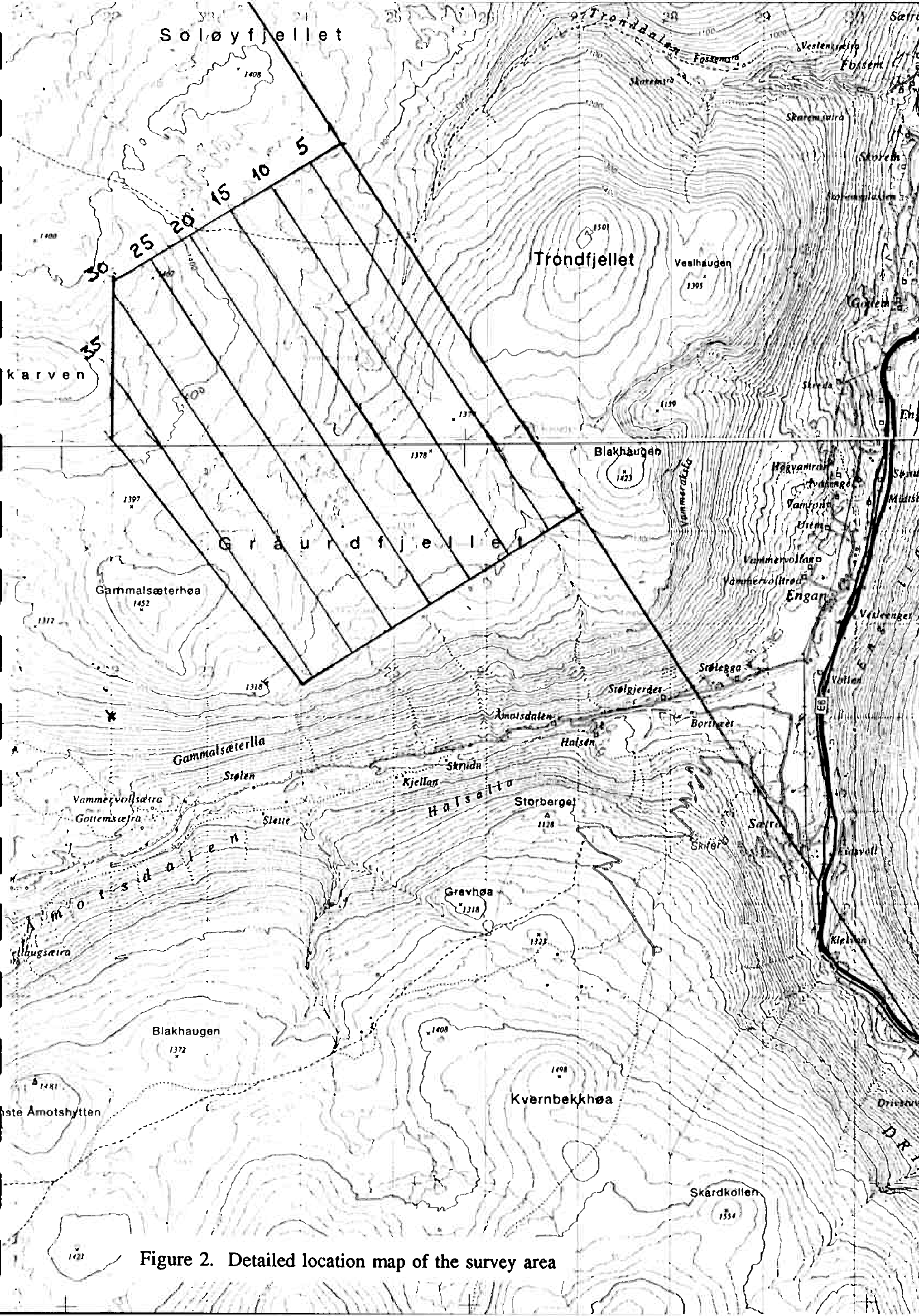
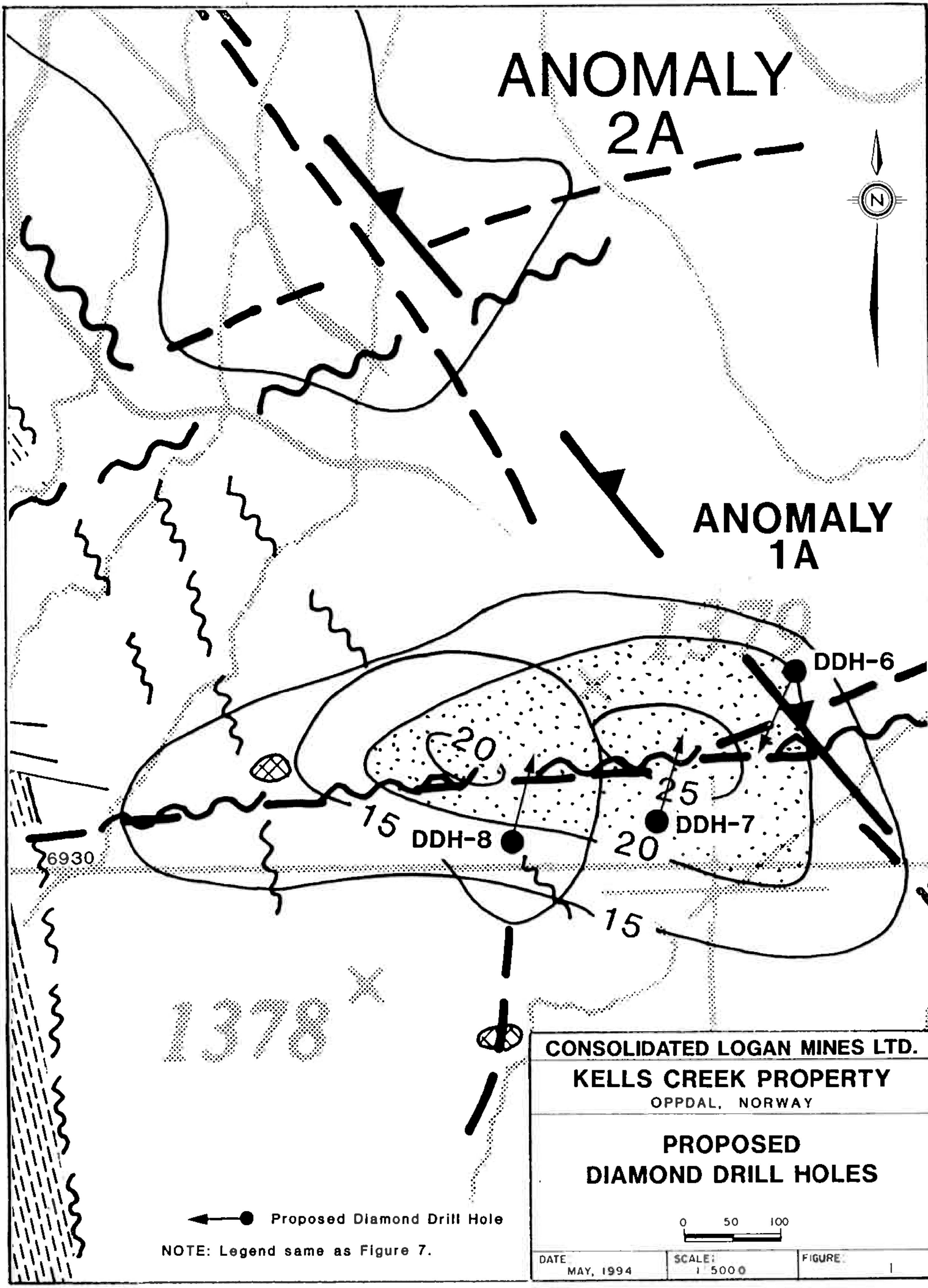


Figure 2. Detailed location map of the survey area

APPENDIX II

FIGURES 1 THRU 6:
PROPOSED DIAMOND DRILL HOLES

FIGURE 7:
STRUCTURE AND ANOMALIES



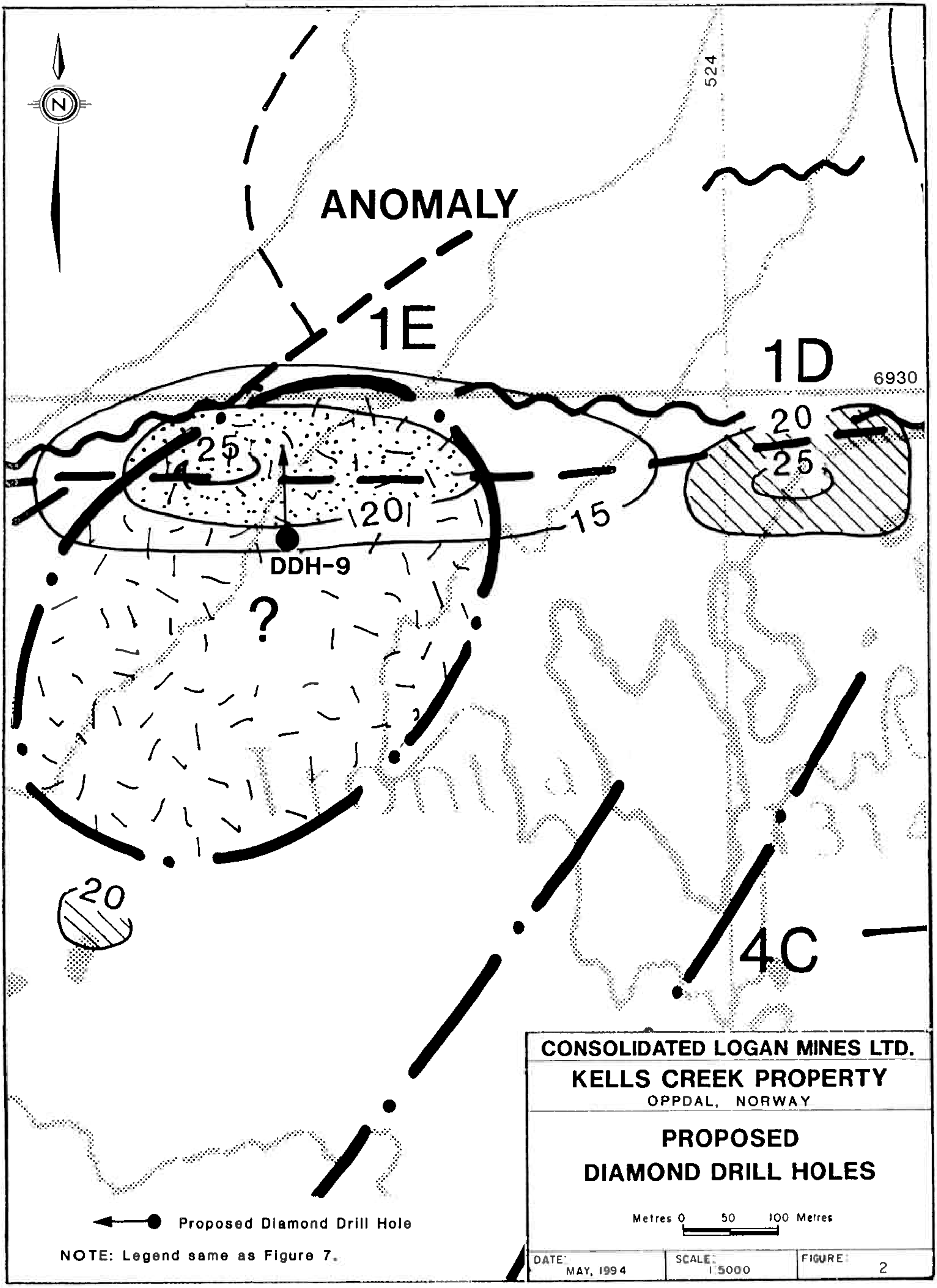
CONSOLIDATED LOGAN MINES LTD.

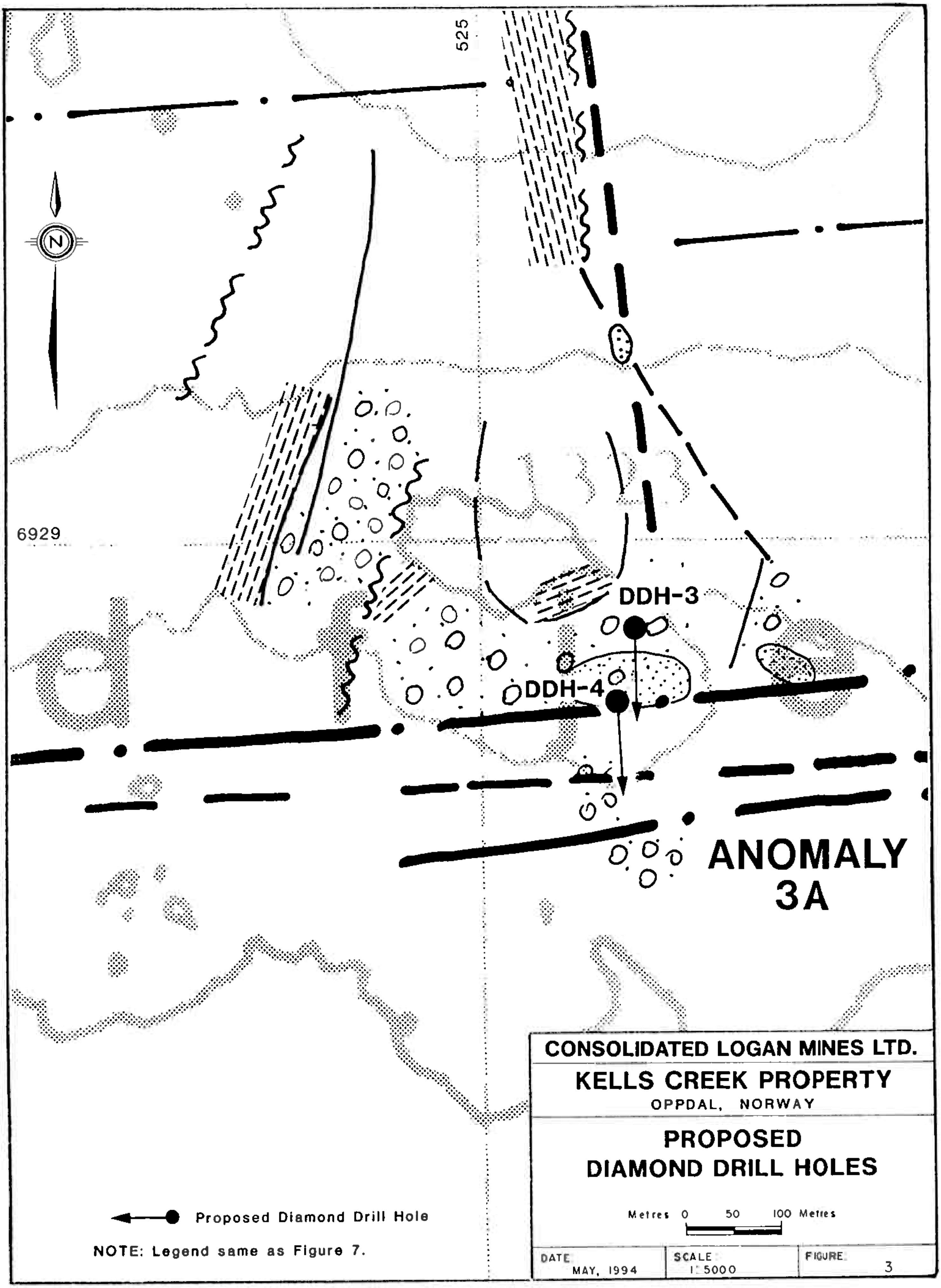
KELLS CREEK PROPERTY

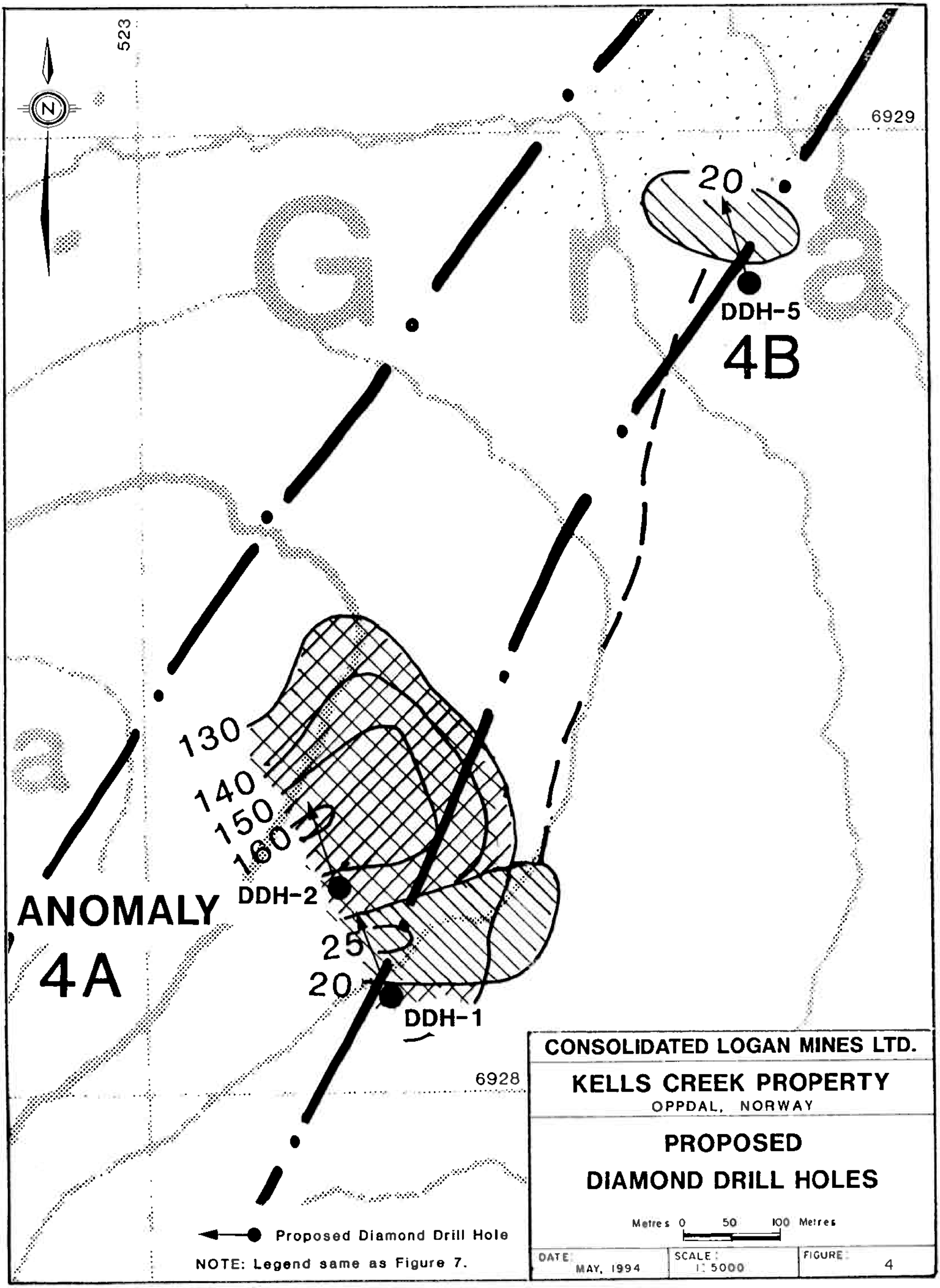
OPPDAL, NORWAY

PROPOSED DIAMOND DRILL HOLES

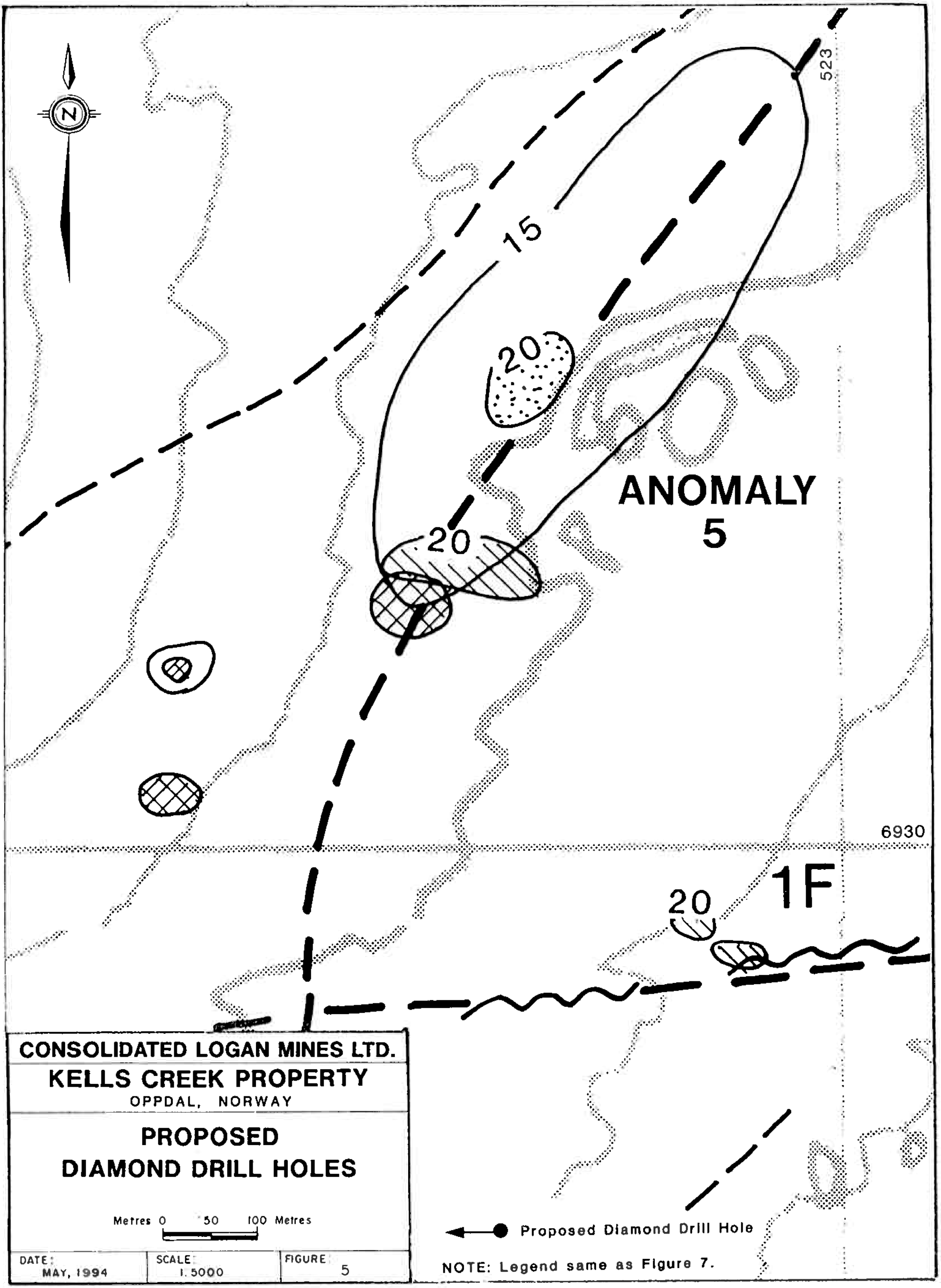
DATE	SCALE:	FIGURE
MAY, 1994	1: 5000	1


N
524
ANOMALY
1E
1D
6930
20
25
25
20
15
DDH-9
?
20
4C
Proposed Diamond Drill Hole
NOTE: Legend same as Figure 7.
CONSOLIDATED LOGAN MINES LTD.
KELLS CREEK PROPERTY
OPPDAL, NORWAY
PROPOSED
DIAMOND DRILL HOLES
Metres 0 50 100 Metres
DATE: MAY, 1994
SCALE: 1:5000
FIGURE: 2


525
6929
DDH-3
DDH-4
ANOMALY
3A
N
Proposed Diamond Drill Hole
NOTE: Legend same as Figure 7.
CONSOLIDATED LOGAN MINES LTD.
KELLS CREEK PROPERTY
OPPDAL, NORWAY
PROPOSED
DIAMOND DRILL HOLES
Metres 0 50 100 Metres
DATE
MAY, 1994
SCALE
1:5000
FIGURE
3



N
523
6929
6928
20
DDH-5
4B
130
140
150
160
DDH-2
25
20
DDH-1
ANOMALY
4A
Proposed Diamond Drill Hole
NOTE: Legend same as Figure 7.
CONSOLIDATED LOGAN MINES LTD.
KELLS CREEK PROPERTY
OPPDAL, NORWAY
PROPOSED
DIAMOND DRILL HOLES
Metres 0 50 100 Metres
DATE: MAY, 1994
SCALE: 1: 5000
FIGURE: 4



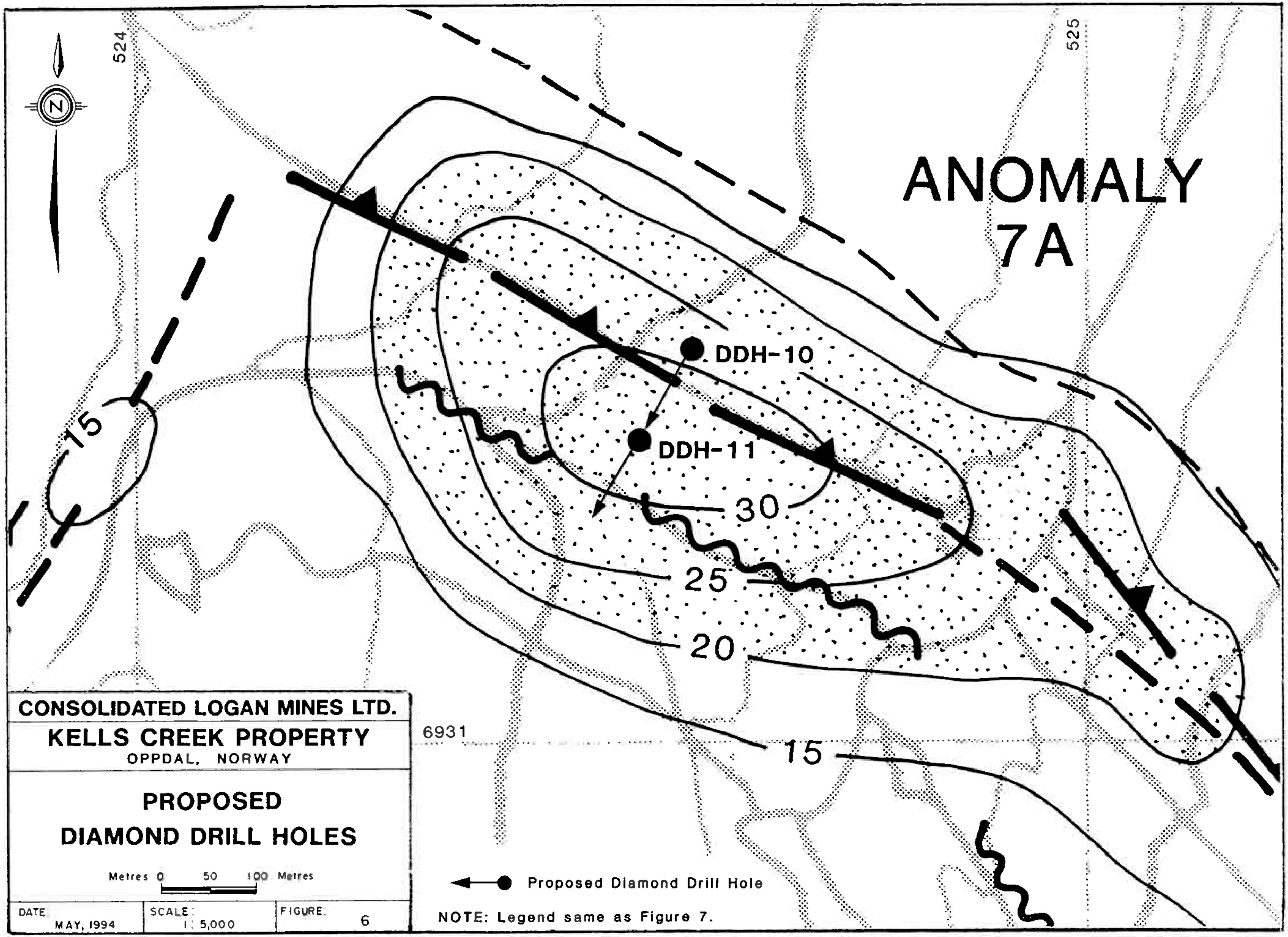
CONSOLIDATED LOGAN MINES LTD.

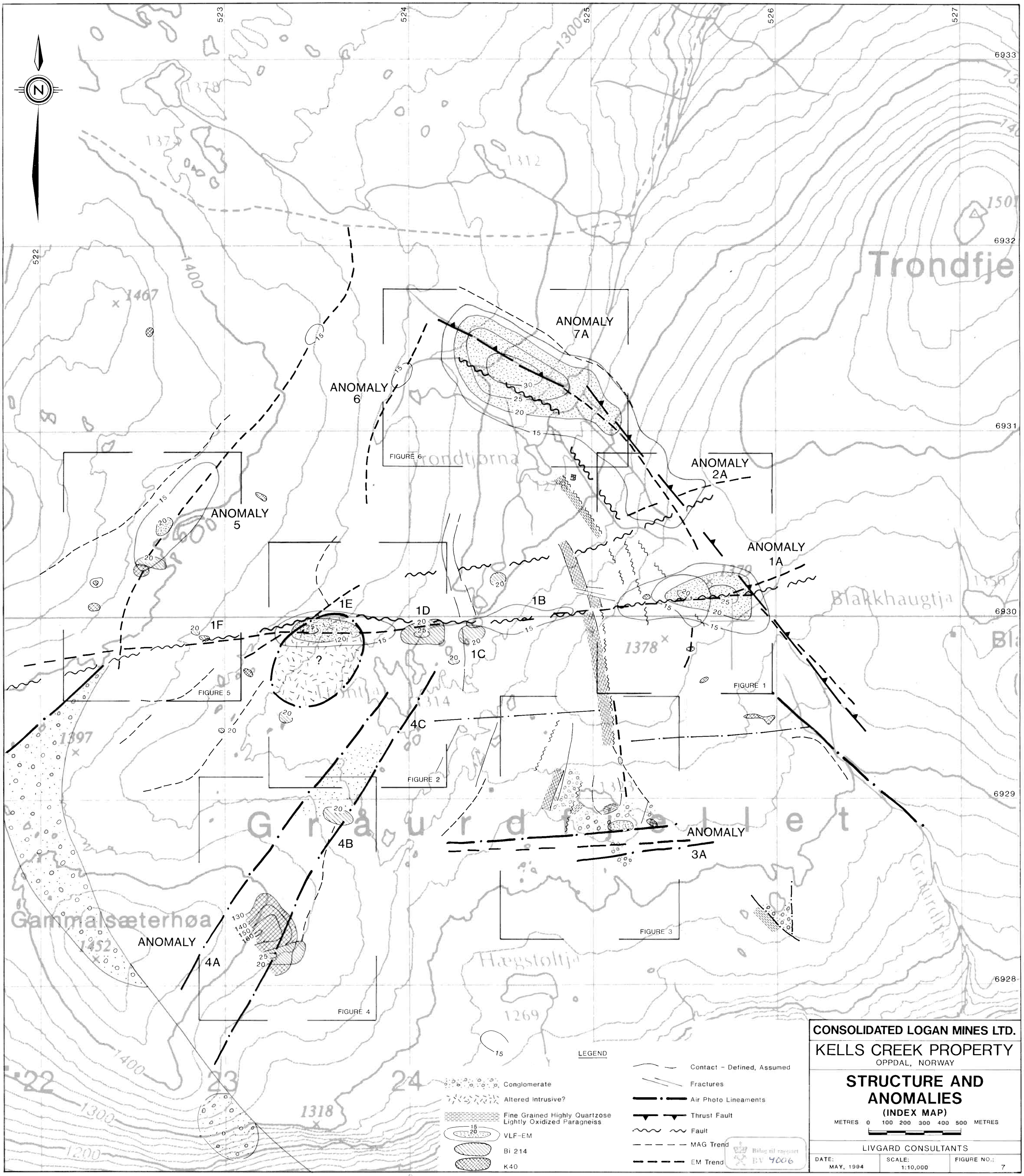
KELLS CREEK PROPERTY

OPPDAL, NORWAY

PROPOSED DIAMOND DRILL HOLES

DATE:	SCALE:	FIGURE
MAY, 1994	1:5000	5


ANOMALY 7A
524
525
6931
N
DDH-10
DDH-11
30
25
20
15
15
CONSOLIDATED LOGAN MINES LTD.
KELLS CREEK PROPERTY
OPPDAL, NORWAY
PROPOSED
DIAMOND DRILL HOLES
Metres 0 50 100 Metres
DATE: MAY, 1994
SCALE: 1: 5,000
FIGURE: 6
Proposed Diamond Drill Hole
NOTE: Legend same as Figure 7.



ANOMALY
7A
ANOMALY
6
ANOMALY
2A
ANOMALY
1A
ANOMALY
5
1E
1D
1B
1F
1C
4C
4B
ANOMALY
3A
ANOMALY
4A
FIGURE 6
FIGURE 5
FIGURE 1
FIGURE 2
FIGURE 3
FIGURE 4
Trondfje
Trondtjørna
Blakkhaugtja
Gråurdfjellet
Gammalsæterhøa
Hægstoltja
1467
1397
1452
1378
1318
1269
1312
1400
1300
1200
522
523
524
525
526
527
6933
6932
6931
6930
6929
6928
N
LEGEND
Conglomerate
Altered Intrusive?
Fine Grained Highly Quartzose Lightly Oxidized Paragneiss
VLF-EM
Bi 214
K40
Contact - Defined, Assumed
Fractures
Air Photo Lineaments
Thrust Fault
Fault
MAG Trend
EM Trend
CONSOLIDATED LOGAN MINES LTD.
KELLS CREEK PROPERTY
OPPDAL, NORWAY
STRUCTURE AND
ANOMALIES
(INDEX MAP)
METRES 0 100 200 300 400 500 METRES
LIVGARD CONSULTANTS
DATE:
MAY, 1994
SCALE:
1:10,000
FIGURE NO.:
7