GREENLAND MINEX News

GREENLAND MINERAL EXPLORATION NEWSLETTER

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Voisey's Bay II in Greenland ?

nickel-diamond ping-pong across Labrador Sea revived interest in Greenland diamonds

Nearly forty years ago, prospector Stan Hilditch climbed to the top of a desolate hump-backed mountain in the Pilbara of Western Australia to make an astonishing discovery. Hilditch was looking for manganese deposits, but instead stumbled across a massive iron resource. The mountain, now known to the world as Mt. Whaleback, proved to be composed of one and a half billion tonnes of high-grade iron ore that is still being exploited through BHP's gigantic Newman operation.

Such romantic, chance discoveries are an important part of mineral exploration history. It is often inferred that they are of the past. In contrast to Newman, the road to other world-class deposits is often long and complicated. Modern exploration is more than ever before geared to the assessment of the importance played by, on the one hand, observation and experience, and on the other, theory and principles. Computer modelling and modern technology add another dimension to the exploration strategies carried out by the professional companies.

With this well-ordered approach in mind, a particularly exciting aspect of Voisey's Bay nickel-copper-cobalt deposit in Labrador is that it was, like Mt. Whaleback, discovered by geological hammer during regional reconnaissance directed towards another commodity: diamonds. Also pertinent is the fact that it was found at a time when Labrador had received the tag of having low mineral potential. Thus the 1994 discovery

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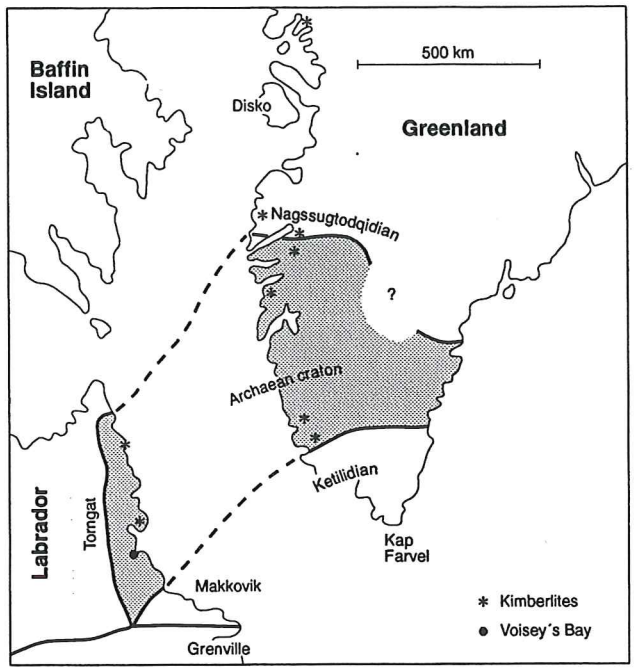
near Voisey's Bay provides a refreshing example of a recent success in which chance, no doubt helped by intuition and faith, is still to be rated high in mineral exploration.

In the last issue of MINEX (No. 9, January 1996) we reported on how the Voisey's Bay discovery was having a spin-off effect in Greenland, with a number of companies lodging applications for ground in the Precambrian shield, particularly in that part of West Greenland facing Labrador. This interest has continued and the region now in focus between 60° and 72°N (Kap Farvel to north of Disko, see map) forms a stretch of coastline much more extensive than that of Labrador. Companies now operating in West Greenland include Diamond Field Resources – at the heart of the Labrador discovery – and Inco, the world's leader of nickel production. But the search for a Voisey's Bay counterpart has also moved across the Inland Ice to East Greenland, where this year a joint venture between Falconbridge and Platinova will explore an igneous complex having some similarity in geological setting to the host rock of the Voisey's Bay nickel deposit. (An up-to-date summary of licences is given in MRA's section 'Regulatory and licensing information').

A successful end to the Voisey's Bay saga for Greenland would be that Voisey's Bay II comes to be located on the eastern side of the Labrador Sea! But there is yet another twist to the saga that might make an equally desirable conclusion: fruition of the long-established diamond potential of West Greenland. In 1995 the Voisey's Bay spin-off activity in Greenland generated its own surprising bonus – the discovery of diamond indicator minerals in stream sediment samples in several localities. This discovery was made by the Australian company Quadrant Resources Pty Ltd in a joint venture with Major General Resources Ltd, as a spin-off in prospecting for Labrador-style nickel mineralisation in the mid-Proterozoic Gardar province of South Greenland.

This discovery has rapidly revived interest in the kimberlite-diamond potential of Greenland, and Monopros Ltd, a subsidiary of De Beers, has again entered the race. This welcome revival of interest in diamonds via Voisey's Bay spin-off exploration completes, rather curiously, a nickel-diamond ping-pong game across Labrador Sea and warns us all once again to learn to 'expect the unexpected'.



Greenland and Labrador in pre-drift reconstruction showing Archaean craton flanked by Proterozoic mobile belts.

Commercial activities

Commercial field operations in Greenland in the summer of 1996 will be dominated by activities initially stimulated by the Labrador nickel-copper-cobalt play. The exploration is being carried out in Precambrian complexes of several ages (early Archaean to late Proterozoic) demonstrating the importance of rock lithology and regional tectonic setting in the exploration strategy, rather than targets of strict age analogy to the mid-Proterozoic Voisey's Bay deposit. A review of the geological criteria applicable to the West Greenland exploration was given in the last issue of MINEX.

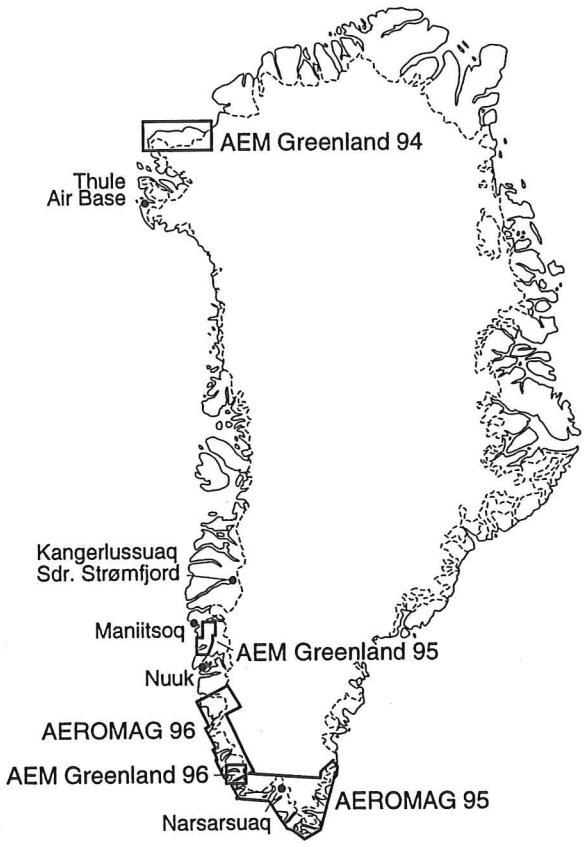
Geological & exploration briefs

Airborne geophysical survey

project AEROMAG and AEM 1996 underway
South-western Greenland in focus

Commercial interest in the south-western side of Greenland – that part of Greenland closest to Labrador – has never been greater. The search of Voisey's Bay II and for diamonds is underway (see leader article of this MINEX). Two airborne geophysical surveys, AEM Greenland and AEROMAG, that covered part of this region in 1995 continue this year with the collection of high-quality magnetic and electromagnetic data (see map for survey areas).

The aims of this geophysical mapping and some results of the 1994 and 1995 surveys have been reported on in previous issues of MINEX. Here we give a brief summary of the 1996 surveys that, as planned, got underway in late May – early June, fortuitously in a period of particularly good weather. The operations, financed by the Greenland Government and the Danish State, are being carried out by Canadian companies on contract with GEUS, after an EU tender round.



Project AEM Greenland 1996

This, the third year of a 5-year project (1994–98), is a helicopter-borne survey of selected areas that cover the Archaean and early Proterozoic supracrustal belts of the region north-east of Ivittuut. The region includes the gold anomalous Tartoq Group. The survey is being flown by Aerodat Ltd with the Danish military base Grønnedal as the operational centre. The aim is 8000 line kilometres at 250 metres spacing of electromagnetic, magnetic and gamma-ray data.

Project AEROMAG 1996

This fixed-wing aeromagnetic survey covers the southern part of the Archaean craton of southern West Greenland, extending the coverage of the AEROMAG 1995 northwards along the coast to 63°45'N (see map). The region covers several of the areas presently being explored for, among other things, nickel-copper and diamonds. The operation is being flown by Geoterrex Ltd, using similar

parameters to AEROMAG 1995, i.e. a 500 m flight line spacing and a 300 m drape. It is planned to fly some 67 000 line kilometres using Nuuk and Narsarsuaq as airport and base facilities.

Results

The final products of the 1996 surveys will be delivered to GEUS at the end of the year. The digital data, as well as other results of the two operations, will be released in the spring of 1997. Companies wishing further information on the 1996 surveys, as well as results of the 1994 and 1995 operations, should contact GEUS in Copenhagen.

With respect to AEROMAG 1995, it should be noted that the release of final data, planned for 1st March 1996, has been delayed because data acquisition was not completed until mid-March. However, preliminary maps were made available for viewing at the Prospectors and Developers Association annual convention in Toronto in March.

Data are now being released in 1996 in three stages:

- Digital data have, since the 15th June, been available for purchase.
- Final map sets at 1:50 000 and 1:250 000 will be available for viewing and purchase in July.
- An open file-type report will be issued in GEUS' Rapport series towards the end of the year.

Further reading

Airborne electromagnetic and magnetic survey of the Maniitsoq–Nuuk area, southern West Greenland. Results from project AEM Greenland 1995 *by* R. W. Stemp, 1996. *Rapport Danmarks og Grønlands Geologiske Undersøgelse* **96/11**, 34 pp.

Airborne electromagnetic and magnetic survey of Inglefield Land, North-West Greenland. Results from project AEM Greenland 1994 *by* R. W. Stemp & L. Thorning, 1995. *Open File Series, Grønlands Geologiske Undersøgelse* **95/1**, 45 pp.

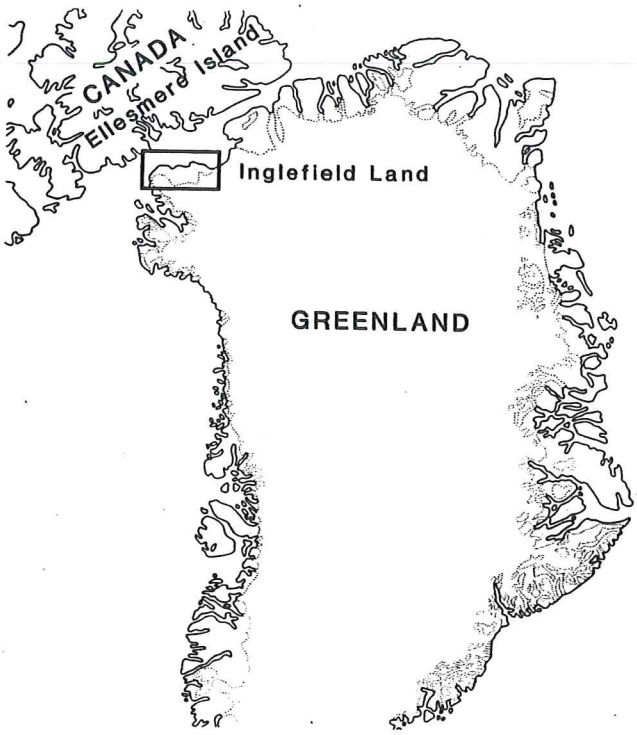
Airborne geophysical survey in 1995 *by* L. Thorning & R. W. Stemp, 1996. *Bulletin Grønlands Geologiske Undersøgelse* **172**, 71–73.

Inglefield Land 1995

no immediate bonanza but mineral potential remains

The release of electromagnetic, magnetic and other data from Inglefield Land, North-West Greenland from the opening season of AEM Greenland 1994–98, was highlighted in previous MINEX issues (Nos 6 and 7, February–March 1995). The geophysical data confirmed that Inglefield Land has high potential for massive sulphides, while colour video verified the presence of numerous circular-shaped features that primed speculation that a 'corridor of diatremes' was waiting to be explored. Exploration licences were granted to two companies: RTZ Mining and Exploration Ltd and Nunaoil A/S, and field work was undertaken between April and September. This field work put paid to the 'diatreme corridor' idea, and the structures – now termed the Minturn circles – are known to be surficial features, interpreted as glacial deposits.

The Survey's field campaign in July and August had the main objective of relating the geophysical anomalies to the regional geology and mineralisation through reconnaissance geological and geochemical mapping. Stream sediment and soil geochemistry indicate a potential for structurally controlled gold and base metal mineralisation which is partly supported by ground mineralisation studies. Two widely separated grab samples have



raised gold values above 1 ppm.

Mineralisation sites investigated fall into two categories: sulphide mineralisation characterised by pyrrhotite, minor pyrite and chalcopyrite, and oxide mineralisation dominated by magnetite. The two groups may be intermixed. Magnetite is widespread in many outcrops of orthogneiss and igneous rocks. Massive magnetite lenses were observed and modelling of the airborne geophysical data in areas of heavy overburden suggests magnetite unit thicknesses up to 300 m, and thus a potential for a significant tonnage.

Although the 1995 follow-up ground work to the exciting geophysical results must be classified as disappointing, it should be stressed that because of deep weathering and extensive surficial cover, a serious check of the many anomalous targets can only be achieved by ground geophysics, detailed geochemistry and drilling. Also, while the Minturn circles can hardly come to play a role in a diamond play, it was the region's correlation with Canadian geology and the kimberlite occurrences there that pierce the Proterozoic – Lower Palaeozoic platform strata, which initially designated northern Greenland as a prospective kimberlite exploration target. This potential remains.

Further reading

Airborne electromagnetic and magnetic survey of Inglefield Land, North-West Greenland. Results from project AEM Greenland 1994 *by* R. W. Stemp & L. Thorning, 1995. *Open File Series, Grønlands Geologiske Undersøgelse* **95/1**, 45 pp.

The Minturn Elv magnetite occurrence, Inglefield Land, North-West Greenland *by* P. W. U. Appel *et al.*, 1995. *Open File Series, Grønlands Geologiske Undersøgelse* **95/15**, 14 pp.

Inglefield Land 1995: geological and economic reconnaissance in North-West Greenland *by* B. Thomassen & P. R. Dawes, 1996. *Bulletin Grønlands Geologiske Undersøgelse* **172**, 62–68.

Reconnaissance geochemical mapping of Inglefield Land, North-West Greenland *by* A. Steenfelt & E. Dam, 1996. *Rapport Danmarks og Grønlands Geologiske Undersøgelse* **1996/12**.

Minturn circles. A new glacial feature *by* P. W. U. Appel, 1996. *Canadian Journal of Earth Sciences.*

Greenland Open File Reports

now part of a new GEUS series

The international mining industry and readers of MINEX have been made aware that one easy route to gaining an insight into aspects of Greenland mineral resources and exploration is through the Open File Series of reports written in English and issued by the Geological Survey of Greenland (GGU). This series was formalised in 1989 with the aim of

speeding up the presentation of new information to the mining industry. Six previously unpublished reports of specific relevance to industry and dating back to 1986, were numbered as the first titles in the series.

The Open File Series thrived on the presentation of raw data from field work and analytical results obtained both by the Survey and industry. The reports cover a wide range of topics, viz. reconnaissance exploration, geochemistry-geophysics, review of specific deposits and types, regional evolution and literature summaries. Over 80 reports were issued in the GGU Open File Series (1986 to 1995).

With the merger of GGU with its older and larger brother, the Geological Survey of Denmark (DGU) to form a single national geological survey – Danmarks og Grønlands GEologiske UnderSøgelse (GEUS; see MINEX No. 9, January 1996) – all open file reports are now issued as part of an unedited Rapport series that started in January 1996.

This Rapport series contains both English and Danish titles on a variety of subjects pertaining to the Kingdom of Denmark (Denmark, Greenland and the Faroe Islands), as well as other countries. The series also contains reports ordered by customers; these are naturally confidential or of limited distribution. Numbering of the reports is based on issue date, irrespective of topic or geographic location, and thus Greenland reports in this series will not be numbered consecutively.

Future issues of MINEX will contain an on-running list of selected Greenland reports of particular relevance to the mining industry. Naturally, MINEX readers can request from GEUS a complete list of all Greenland titles in the new Rapport series.

Greenland Report of Activities 1995

short articles on current research and field work

The Survey's 'Report of Activities' for 1995 covering Greenland projects and results of recent field work, is now available (*Bulletin Grønlands Geologiske Undersøgelse* **172**, 119 pages). The report contains 20 articles dealing with a wide range of topics including mineral resource investigations, geological mapping, petroleum geology and glacier and climatic research. One article dealing with the resources of sedimentary basins in North and East Greenland, describes an integrated petroleum and ore geological research project. The report contains four articles from The Danish Lithosphere Centre (affiliated to GEUS), including a progress report on field work and research in the Nagssugtoqidian Orogen of West Greenland. This extensive mobile belt is the target of present commercial exploration, made topical by the inferred correlation to the Palaeoproterozoic terrane Torngat Orogen of Labrador (see map page 2).

Publication of 'Report of Activities' 1995 marks the last issue of *Bulletin Grønlands Geologiske Undersøgelse*. Future 'Report of Activities' will appear in the new Survey series *Geology of Greenland Survey Bulletin*.

Regulatory & licensing information

Exclusive licences

status

Exclusive licences location map page 9

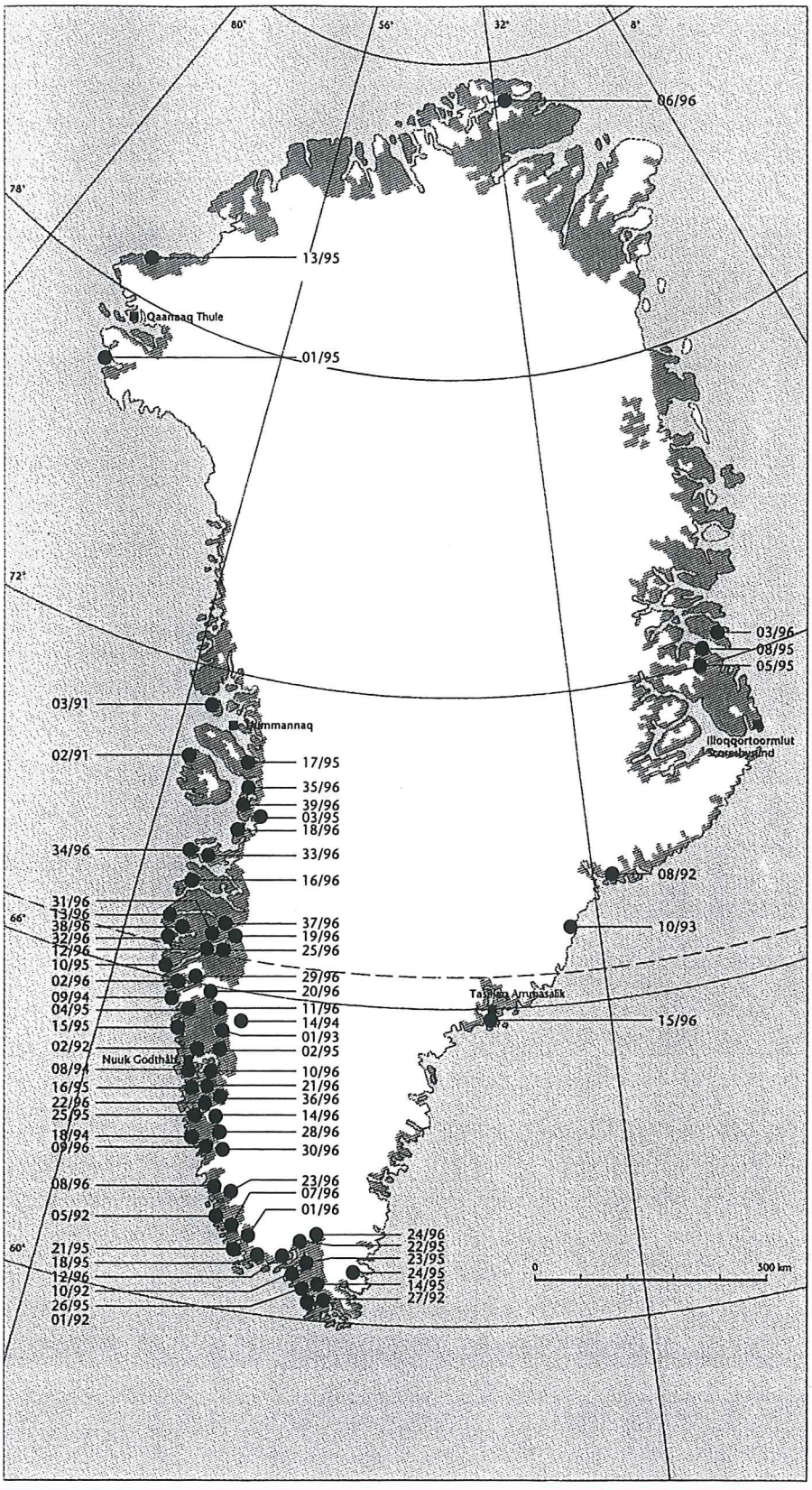
Licences	Location	Area
02/91: Falconbridge Greenland A/S	Disko-Nuussuaq	794 km^2
03/91: Falconbridge Greenland A/S	Nuussuaq-Svartenhuk	250 km^2
01/92: Nunaoil A/S	Nanortalik	376 km^2
02/92: Nunaoil A/S	Storø near Nuuk	83 km^2
05/92: Nunaoil A/S	Sermiligaarsuk	175 km^2
08/92: Platinova A/S	Skærgaard, E. Greenland	88 km^2
10/92: Highwood Res. Ltd.	Kangerluarsuk near Narsaq	34 km^2
12/92: Mineral Dev. Int. A/S	Tunulliarfik near Narsaq	58 km^2
27/92: Nunaoil A/S	Nanortalik	232 km^2
01/93: Nunaoil A/S	Isukasia	178 km^2
10/93: Quadrant Res. Pty. Ltd.	Kruuse Fjord, E.Greenland	26 km^2
08/94: Nunaoil A/S	Malene near Nuuk	316 km^2
09/94: Nunaoil A/S	Maniitsoq	181 km^2
14/94: RTZ Mining and Expl. Ltd.	Isukasia	71 km^2
18/94: Valhalla Mining Ltd.	Fiskenæsset	168 km^2
01/95: Nunaoil A/S	Thule	1,201 km^2
02/95: Nunaoil A/S	Ivisatoq near Nuuk	326 km^2
03/95: Nunaoil A/S	Disko Bay	1,332 km^2
04/95: Cominco Res. Int. Ltd.	Søndre Isortoq	4,332 km^2
05/95: Platinova A/S	Malmbjerget	6 km^2
08/95: Platinova A/S	Mellempas near Mestersvig	104 km^2
10/95: Ujarak Minerals ApS	Itilliuq Qeqertaa, Maniitsoq	5 km^2
13/95: Nunaoil A/S	Inglefield Land	684 km^2
14/95: Platinova A/S	Amitsoq	402 km^2
15/95: Platinova A/S	Nuuk-Maniitsoq	3,390 km^2
16/95: Platinova A/S	Buksefjord	510 km^2
17/95: Diamond Fields Res. Inc.	Itillii near Ata Sound	296 km^2
18/95: Diamond Fieids Res. Inc.	Qaqortoq	2,245 km^2
21/95: Quadrant Res. Pty. Ltd.	Kobberminebugt	904 km^2
22/95: Quadrant Res. Pty. Ltd.	Narsarsuaq	583 km^2
23/95: Softrock Petroleums Ltd.	Qaqortoq	349 km^2

(continued next page)

Exclusive licences location map page 9

Licences	Location	Area
24/95: Softrock Petroleums Ltd.	Lindenow Fjord	1,102 km^2
25/95: Satellite Holdings Ltd.	Bjørnesund	193 km^2
26/95: Platinova A/S	Qaqortoq	291 km^2
01/96: Diamond Fields Res. Inc.	Kobberminebugt	777 km^2
02/96: Ujarak Minerals ApS	Evighedsfjord	77 km^2
03/96: Tertiary Gold Ltd.	Trail Island, E.Greenland	1,288 km^2
06/96: Platinova A/S	Frederick E. Hyde Fiord, N.Grl.	1,929 km^2
07/96: Ivittuut Minerals A/S	Ivittuut	5 km^2
08/96: Quadrant Res. Pty. Ltd.	Paamiut	426 km^2
09/96: Quadrant Res. Pty. Ltd.	Bjørnesund	153 km^2
10/96: Quadrant Res. Pty. Ltd.	Kapisillit	202 km^2
11/96: Quadrant Res. Pty. Ltd.	Isukasia	521 km^2
12/96: Quadrant Res. Pty. Ltd.	Sarfartoq	381 km^2
13/96: Quadrant Res. Pty. Ltd.	Sisimiut	289 km^2
14/96: Nunaoil A/S	Bjørnesund	760 km^2
15/96: Nunaoil A/S	Kulusuk, Tasiilaq	1,470 km^2
16/96: Inco Ltd.	Nordre Strømfjord	1,711 km^2
18/96: Quadrant Res. Pty. Ltd.	Qasigiannguit	465 km^2
19/96: Quadrant Res. Pty. Ltd.	Kangerlussuaq	219 km^2
20/96: Quadrant Res. Pty. Ltd.	Majoqqaq near Maniitsoq	399 km^2
21/96: Quadrant Res. Pty. Ltd.	Ameralla near Nuuk	170 km^2
22/96: Quadrant Res. Pty. Ltd.	Grædefjord	244 km^2
23/96: Quadrant Res. Pty. Ltd.	Kvanefjord	151 km^2
24/96: Texas Energy Corp. N.L.	Johan Dahl Land	271 km^2
25/96: Texas Energy Corp. N.L.	Sarfartoq	104 km^2
28/96: Platinova A/S	Nuuk to Paamiut	13,178 km^2
29/96: Platinova A/S	Nuuk to Kargerlussuaq	11,900 km^2
30/96: Quadrant Res. Pty. Ltd.	Adlumersat near Paamiut	103 km^2
31/96: Quadrant Res. Pty. Ltd.	Amitsorssuaq, Kangerlussuaq	196 km^2
32/96: Quadrant Res. Pty. Ltd.	Sisimiut	204 km^2
33/96: Quadrant Res. Pty. Ltd.	Tunertoq near Kangatsiaq	236 km^2
34/96: Quadrant Res. Pty. Ltd.	Ikerasarssuk, Kangatsiaq	141 km^2
35/96: Quadrant Res. Pty. Ltd.	Rodebay	194 km^2
36/96: Quadrant Res. Pty. Ltd.	Ameralik	169 km^2
37/96: Quadrant Res. Pty. Ltd.	Saningassoq, Kangerlussuaq	170 km^2
38/96: Quadrant Res. Pty. Ltd.	Sarfanguaq near Sisimiut	241 km^2
39/96: Quadrant Res. Pty. Ltd.	Rodebay to Ilulissat	259 km^2

Location map of exclusive licences in Greenland – as of June 30



Exploration licences

During the first 6 months of 1996 Greenland has experienced an explosive growth in the areas covered by exploration licences for minerals. Thus, late June 1996 more than 60,000 km2 are covered by 68 exclusive exploration licences for minerals. This contrasts with nearly 29,000 km2 under 42 exploration licences one year ago.

Most of the growth has been caused by the following:

- Quadrant Resources Pty. Ltd. has been granted 22 exploration licences covering 5,533 km^2 directed at the diamond potential.

- Platinova A/S has been granted 2 exploration licences covering 25,078 km^2 mainly directed at the diamond potential.

- Inco Limited has been granted 1 exploration licence covering 1,711 km^2.

3 new companies are starting exploration in 1996 in Greenland: Inco Limited has a large exploration licence (16/96), the Australian company Texas Energy Corporation N.L. has 2 exploration licences (24/96 and 25/96) and Monopros Ltd. has been granted a prospecting licence (non-exclusive) and is partnering with Quadrant in a number of exploration licences.

The number of exclusive licences for minerals and the number of km2 covered are a peak record in Greenland exploration history.

New licences

Since January 1996 the new exploration licences 08/96-16/96 and 18/96-39/96 (exclusive) have been granted. A number of prospecting licences (non-exclusive) have also been granted.

Amendments of existing exploration licences

The following exploration licences have been amended:

- Licence no. 02/91 on Disko-Nuussuaq was increased from 345 km^2 to 794 km^2 by transfer of 421 km^2 from licence no. 03/91 plus a new area of 28 km^2.

- Licence no. 03/91 on Nuussuaq-Svartenhuk was consequently reduced from 671 km^2 to 250 km^2.

- In licence no. 10/92 at Kangerluarsuk near Narsaq an interest of 25% was transferred from Platinova A/S to Mountain Minerals Co. Ltd. Highwood Resources Ltd. has still the remaining 75% interest.

A new service from the Mineral Resources Administration

As described in the previous issue of MINEX a new application procedure for mineral licences was introduced as of January 1, 1996.

Under this procedure applications for exploration licences are processed in application batches covering the periods from the 1th to the 15th of a month and from the 16th to the end of a month. An application for an exploration licence cannot comprise areas covered by exclusive licences already granted or areas covered by applications in previous application batches.

Therefore, an applicant is advised to contact MRA prior to submitting an application for an exploration licence in order to receive information on those areas which cannot be included in an application.

For this purpose MRA prepares a bimonthly list indicating those exclusive licence areas for minerals which shall be respected by new applications for mineral exploration licences.

The list contains i.a. the following sections:

Section I: Mineral exploration licences in force.

Section II: Mineral exploration licences which have been applied for in previous application batches and which are being processed by the authorities. Also applications for area enlargements are included in this section. However, the identity of the applicants will not be disclosed until the licences or licence amendments have been granted.

Section III: Mineral exploitation licences in force.

Section IV: Mineral prospecting licences in force.

The list may be requested from MRA on a regular basis. All licence texts including licence area maps are available from MRA. Also MRA's publication "Application Procedures and Standard Terms for Exploration and Prospecting Licences for Minerals in Greenland" is available.

It is MRA's intention to make the material available on the internet later.