
# Recent developments in diamond exploration in Sweden

*by Jan-Ola Larsson*

**With increasing demand for high quality diamonds and some classical, producing deposits becoming expensive, worldwide exploration for new diamond deposits continues to grow at an ever increasing speed. Since the beginning of the 1990s new regions like the shield areas of Canada and USA have rapidly came into focus and since the beginning of the 1990s even the Nordic countries like Sweden, Norway and Finland have attracted international diamond exploration companies. One of the main reason is major changes in mineral policy and legislation, which were introduced primarily in Sweden and Finland.**

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With increasing demand for high quality diamonds and some classical, producing deposits in Russia (Mir and others) and South Africa (Kimberley mines) rapidly becoming expensive, high cost producers with depleted reserves, world-wide exploration for new diamond deposits continues to grow at an ever increasing speed. The search for new deposits goes on in the traditional regions in the western world like southern Africa, Australia and South America.

However, since the beginning of the 1990s new regions like the shield areas of Canada and USA have rapidly become the focus for all major diamond-exploring companies (De Beers, Rio Tinto, Ashton Mining, BHP etc.) as well as hundreds of junior companies. In the arctic regions of Canada aggressive exploration using advanced techniques has resulted in a number of new discoveries of diamondiferrous kimberlites. One of the early finds in 1991 at Lac de Gras in the Northwest Territories is today becoming the latest world class diamond producer. The mine is owned by the Australian giant BHP (BHP Diamonds Inc.) and the Canadian discovery company DiaMet. The operation, which has been named the Ekati Diamond Mine, is in a final construction phase with first production expected in late 1998.

Since the beginning of the 1990s the Nordic countries like Sweden, Norway and Finland, which all are partly underlain by the Baltic shield, have attracted international diamond exploration companies. Among the explorers active in the Nordic diamond search we find major companies like De Beers, Rio Tinto and Ashton Mining as well as several junior companies from Canada and Australia. Of particular interest for diamonds is the northern region within the potentially favourable Archean craton area.

It is important to realise that one of the main reasons why the Baltic shield region today has come into focus are major changes in mineral policy and legislation, which were introduced primarily in Sweden (1992) and Finland (1994). Both countries have liberalised their mineral laws making exploration and mining favourable for international companies.

Today, many experts consider that the Baltic shield represents one of the world's major, unexplored regions for diamonds. Considering the many similarities in geology and environment between Canada and northern Scandinavia, exploration techniques developed and used in North America can easily be applied in the Baltic shield diamond search.

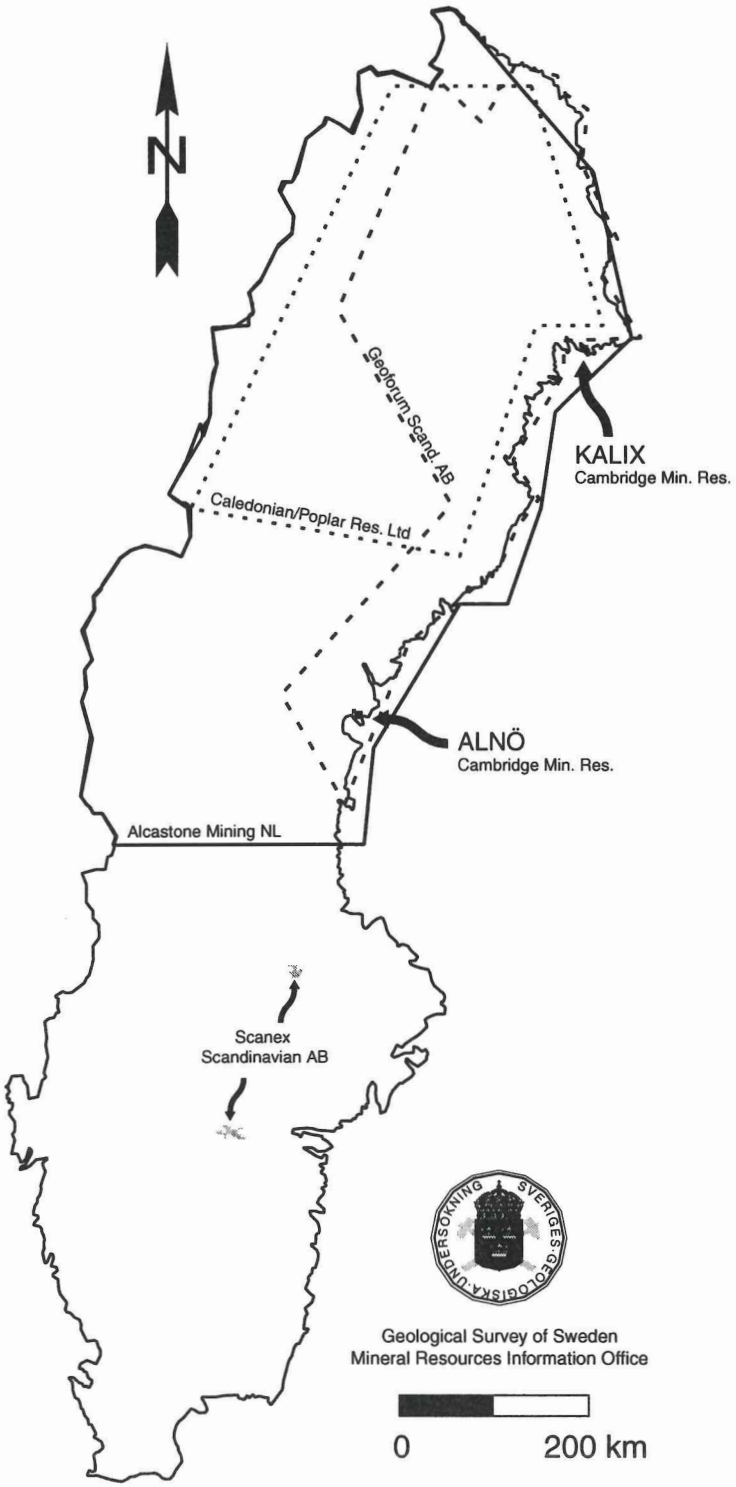
Owing to the large interests in diamonds from the public as well as industry, this report will mainly focus on the exploration scene in Sweden and summarise most of the developments and results from each of the companies involved in diamond exploration in Sweden.

In describing the companies, aspects of their exploration activities are specially noted. Sources of information are publicly available company reports, newspaper extracts and direct contacts with persons in leading positions within the companies. Some companies release quite detailed information of their exploration activities whereas others give only sparse information.

## Legal framework

Most significantly for the present exploration boom in Sweden has been the introduction of a new, liberalised Mineral's Act in 1992. Among many changes introduced to attract international explorers, the most drastic has been the abolishment of the "crown-share" system. Previously the Swedish State could claim up to 50 per cent royalty on the production of any mining venture in the country. Today in Sweden, there are no royalties or any other duties whatsoever to the State on mining enterprises including diamond-mining.

Important for diamond explorers are the changes, which make it possible for companies to register exploration permits specifically for diamonds. Before




***Exploration licenses for diamonds in Sweden, 1998.***

1992 diamond was a "landowner's mineral", which refrained from systematic, large-scale surveys by exploration companies.

Exploration permits issued for diamonds are valid for three years and can be extended up to a maximum of ten years. Fees, generally considered to be realistic in the international context, are levied on an area basis. For diamonds this amounts to 1.50 SEK (0.20 USD) per hectare. For each licence area an application fee of 6000 SEK has to be paid together with the registration of the application. Mining concessions or exploitation permits, awarded preferentially to the actual exploration holder, are valid for 25 years. An exploitation permit can be renewed for a further ten years if the area is being mined or if large scale exploration is underway.

Environmental protection requirements are strict in Sweden, but by general consensus, are applied in a practical and realistic manner. One of the key features of the Swedish environmental legislation in general is its clarity, setting out precise guidelines, within which exploration and mining companies can be confident.

Important changes in the mineral policy in Sweden also included the drastic move to stop all mineral exploration funded by the Swedish State. Instead, all exploration in the country has been left to the private industry. Thus, while before 1992 having the Swedish State as an opponent in the exploration race, today the private companies are having the State, through the Geological Survey of Sweden (SGU), as a co-operative partner. To interested parties SGU can provide basic, regional data on geology, geophysics and geochemistry obtained in the continuous mapping programmes of the country as well as documented data and results from earlier exploration surveys by the state organisation companies like LKAB and SGAB.

Up until now this policy change has resulted in the international companies,

which made their entry into Sweden after 1992, more than replacing the State exploration funding, as far as total costs are concerned. For 1997 the total exploration costs in Sweden are expected to exceed 30 M USD. Most of the exploration is directed towards gold and base metals and only two percent of the costs so far are related to diamond exploration. For 1998 an increase on the diamond side is, however, forecasted.

With the introduction of a new, liberalised and open mineral policy coupled with a corporate tax level at only 28 per cent, Sweden has rapidly become strongly competitive relative other mining countries to attract international exploration companies. Today, the country is enjoying a healthy exploration boom with a large number of exploration companies coming from overseas, including several companies specifically interested in diamond opportunities.

## Early studies and diamond finds in Sweden and Scandinavia

Up until late 1980s no serious large scale exploration for diamonds of the type which today is carried out by exploration companies world-wide, had been put into practise in Sweden. However, over the years a number of geological research studies on kimberlite-looking rocks with possible diamond affinities have been reported. These have mainly been focused on the classical Alnö region at Sundsvall in north-central Sweden. This local region of unique bedrock-types has attracted a lot of attention from both Swedish and international geologists. Diamonds were also reported to have been recovered by Dr P. Kresten in a bulk sampling research program in 1981. However this diamond find was later disputed as some contamination from drilling with a diamond drillbit.

Reports of single diamond finds have been noted in river sediments in northern Scandinavia i.e. in the river Karasjokk in Norway 1995 and the river Pasvik in the 1890s on the border between Norway and Russia. Possible bedrock sources for these diamond finds can be traced to the northern part of Swedish or Finnish Lapland.

The Karasjokk find is the first, well documented diamond discovery in Norway. It was found by a prospector while panning for gold in Finnmark region in the summer of 1995. The slightly yellowish diamond is of macrodiamond size with a diameter of 2 mm and weighing 0.069 carat (0.0138 g). The positive identification of the diamond was made by the Norwegian Geological Survey.

In 1891, the well-known Swedish explorer A. E. Nordenskiöld, at a meeting at the Swedish Geological Society, showed some diamonds, which earlier had been found by French professor Charles Rabot by panning some "reddish" sediments in the Pasvik river in northern Norway. Today the whereabouts of these diamonds are unknown and thus this diamond find has not been truly confirmed.

Following some unconfirmed rumours of diamonds found in the summer of 1994 in northern Sweden the first real proof of a diamond find in the country was reported late in 1996. Two local prospectors had found a glacial till boulder, which contained some diamonds of up to 2.0 mm in size. The identification of the diamonds was made with the assistance of the Geological Survey of Sweden and a highly qualified laboratory in England.

In a recent agreement between the prospectors and the junior company North Star Diamonds AS (NSD), a subsidiary of the Canadian company Poplar Resources (see below), the prospectors have provided NSD the exact location of the find as well as the diamonds and host material for analysis. Still the exact location site is kept secret as a company asset for future follow up plans in the local area. However, some of the analytical results have just been released. It appears that the hostrock is a lamproite. This rock type is one of the two main hostrocks for diamonds. The other, most commonly occurring, is kimberlite.

The finding of a diamondiferrous boulder in a glaciated environment is an extremely rare occurrence. Generally, boulders of kimberlite or lamproite will quickly disintegrate by the mechanical erosion of a glacial ice. The unique boulder find has been top exploration news on diamonds in the Swedish press during 1996–97. The find has greatly accelerated the interest in diamonds from the general public as well as industry in the region. For further details see company reports below.

## COMPANIES ACTIVE IN DIAMOND EXPLORATION IN SWEDEN

### Alcaston Mining NL *(Listed on the Australian Stock Exchange, Sydney)*

**General**. Alcaston Mining is a junior exploration company with main interests in gold in Australia and diamonds in Sweden. Mr Clarke Dudley is the managing director and the main office is located in Armadale, close to Melbourne in Australia. A major shareholder is Pegangeo Properties Pty Ltd (14.50 per cent). Among the company's assets one can note the New Dawn Gold Mine in Woods Point-Walhalla gold province in Victoria. Encouraging, high grade results from exploration work in the mine and in the surroundings may lead to the reopening of the mine, which has been closed for the last 30 years. In 1996 Alcaston Mining entered a joint venture on an open cut gold mining project at Wedderburn in the Golden Triangle region of the state of Victoria.

Annual exploration expenditures until June 1996 amounted to AUD 99 000. Total market capitalisation at May 2nd 1996 was AUD 1 891 000.

**Exploration in Sweden.** Alcaston Mining was among the first companies to be interested in diamond exploration in Sweden, when the new Mineral's Act

was introduced in 1992. After selective studies in 1994 of airborne magnetic data available at the Geological Survey of Sweden (SGU), Alcaston Mining filed an application for a diamond concession, which roughly covered all of the northern half of Sweden (approximately 270 000 $km^2$). In order to get an exploration licence any company has to pay the area fee in advance (about USD 0.20/hectare), as is stated in the Mineral's Act. In the Alcaston case, because of the huge area, this fee amounts to 3.4 M USD. The Mining Inspector gave Alcaston six weeks to put forward the money. The timespan was, however, too short for Alcaston to complete the formalities. The company had hoped to get at least a six months period of trust.

After an initial appeal, which was rejected by the Mining Inspector, Alcaston again registered the case at the local administrative court of appeal. This time Alcaston was awarded seven weeks to raise the money. Alcaston again found the time span too short to be able to raise the sum and asked for a prolonged money-raising period, but this was rejected in June 1996 by the administrative court of appeal. In June 28, 1996 Alcaston turned the case to the highest court level in Sweden, the Supreme Administrative Court of Appeal, and asked for a leave to appeal in order to get enough time to raise the money.

This court case still has not been settled, although more than three years have passed since the start of the case. Instead of spending money on fieldwork Alcaston, so far, has spent a large amount of dollars on lawyers. Because of the extremely long period of waiting for the companies behind Alcaston on the waiting list for diamond licence registration in northern Sweden, some companies with serious diamond exploration interests have changed priorities as well as interest areas and left Sweden.

However, a settlement of the case out of the court may be forecasted with the news released in June 23, 1997 that Alcaston Mining had formed a joint venture with Poplar Resources (see below) for diamond exploration in Sweden. The companies will combine their interests and expertise to further mutual diamond exploration efforts in Sweden. Recently Poplar transferred all assets in Sweden into the newly formed subsidiary company, North Star Diamonds AS (see below), which in practice will be the company, which will continue the joint venture with Alcaston in Sweden and carry out the exploration in the future.

**Ashton Mining Ltd** *(Listed on the Australian Stock Exchange, Sydney)*

**General.** Ashton Mining is a major diamond producer and worldwide diamond explorer. The company has a 40 per cent share of the diamond production from the Argyle mine in Western Australia. Argyle is the largest diamond mine in the world with a production in 1996 of 42 million carats, which represents about 40 per cent of the total mine production of diamonds in the world. Ashton's corporate assets include a 33 per cent interest in Aurora Gold, a gold mining and exploration company listed on the Australian Stock Exchange. Aurora Gold owns the Mt Muro goldmine in Indonesia, which in 1996 produced 231 000 gold equivalent ounces at an average cost of USD 210 per ounce. Ashton also has a 62 per cent interest in Ashton Mining of Canada, which is listed on the Montreal and Toronto Stock Exchanges.

Today Ashton Mining is in charge of several advanced diamond development projects in such various places in the world as Indonesia, Angola and Australia, among which the Merlin project in the Northern Territory of Australia is close to become the company's next diamond hard rock mine. Large-scale exploration projects for diamonds are also carried out by Ashton subsidiary companies in the Nordic countries and in the Karelian area of Russia. In 1996 the Ashton Group total exploration and evaluation expenditures amounted to 15.8 M AUD.

***Stream sampling for diamonds in Sweden.***

**Exploration in Sweden.** Exploration surveys in Sweden by Ashton Mining started already in the 1980s. In a joint venture with the State Mining Property Commission (NSG) Ashton investigated a 60 000 $km^2$ area in northern Sweden. NSG ceased to exist in 1993 and today the Swedish Board for Industrial and Technical Development (NUTEK) has inherited the NSG part. Ashton Mining has a 51.6 per cent share in the joint venture and has covered all the costs in the project to progressively increase its equity.

In their quarterly report in September 1994 Ashton announced that northern Sweden has a favourable geological setting for the discovery of diamond-bearing kimberlites. Following a helicopter supported, reconnaissance stream sediment sampling program of a total of 1 500 samples from the Swedish joint venture area, the most northerly area was selected for further studies.

In 1995 Ashton Mining, through its Finnish subsidiary Minash Finland Oy, was granted a concession to explore for diamonds of an area of close to 5 000 $km^2$ underlain by Archean rocks between Kiruna and the Finnish border in northernmost Sweden. Within this area further attention was focused on 13 follow up targets, which all had returned kimberlite indicator minerals.

At this time a legal dispute started between Ashton and the Swedish Space Corporation over the concession area granted to Ashton Mining. The main part of the diamond licence area is located within the Esrange space rocket testing ground and the Swedish Space Organisation strongly opposed the decision of the Mining Registrar. However after further sampling of the priority targets Ashton decided to leave its concession in 1996. Today Ashton's diamond interests are concentrated to Finland, where some extremely interesting results have come forth.

**Exploration in Finland.** In Finland Ashton has so far discovered 24 kimberlite bodies, of which 16 are diamondiferrous. Most of the kimberlites are located under 5–25 m of glacial deposits. At least two of the more closely studied pipes contain substantial quantities of clear and colourless diamonds. A sample of 23 t from the pipe of approximately two hectares in surface area yielded a grade of 26 carats of +0.8 mm diamonds per 100 t. Most of these diamonds were of high quality. Another pipe, just over one hectare in size, contained 13 to 26 carats per 100 t, based on a sample weight of 9.4 t. However for economic evaluations these grades so far have been considered low. Further testing and bulk sampling are continuing.

## Cambridge Mineral Resources

*(Listed on the London Stock Exchange)*

**General.** Cambridge Mineral Resources (CMR), led by Dr Robert Young, is a junior exploration company with its main office in Ely, Cambridgeshire, England. The company has focused its efforts on gemstone exploration and development in Western Europe and has acquired prospecting rights for diamonds in Sweden and Ireland. The company also has exploration licences for amethyst, beryl and sapphire in Ireland, as well as emerald and alexandrite in the Galicia district in the north-western part of Spain.

**Exploration in Sweden.** In 1996 CMR started exploration fieldwork for diamonds in northern Sweden. Through the exploration expenditure, CMR will earn a 51 percent controlling interest in the Kalix and Alnö exploration permits for diamonds. The two permits, which cover a total area of 119 $km^2$, were issued in September 1995 to Nordic Exploration (Nordex) AB, the Swedish subsidiary of European Mining Finance (EMF), which is a Luxembourg quoted company. The licences are renewable for a further three years. Based on an option exercised in June 1996, CMR agreed to spend USD 250 000 over a three-year period on the Alnö and Kalix licences.

Since December 1996 CMR has a full collaboration agreement both with EMF and Nordex AB, with a right of assignment.

Although the licence areas are quite small relative to claimed areas of other companies in Sweden, a large amount of information has been released by CMR of results from their Swedish surveys.

**Geology of the Kalix area.** The licensed area, which formally is called Ryssbält, is located along the northern shorelines of the Bothnian Bay close to the town of Kalix about 60 km north-east of Luleå. A number of alkaline and ultrabasic dykes are outcropping on the Bothnian Bay shoreline as well as on the local archipelago islands. The dykes are less than one metre in thickness and strike in a north-south direction. No diatrem or larger massif of kimberlitic rocks have so far been found in the area. The dykes are of late Proterozoic age and intrude into Archean mafic volcanics as well as early Proterozoic metasediments. Granites and gabbroic intrusions are also known in the area.

To the west of the licensed area is the north-south trending Baltic-Bothnian megashear, which is clearly seen as a magnetic low on an aeromagnetic image and also produces a gravity low. The shear was active in the early Proterozoic age resulting in a sinistral displacement of 160 km.

**Exploration techniques.** CMR has adopted similar exploration techniques to those employed successfully by other companies in areas of thick glacial overburden (i.e. Canadian Shield areas). The techniques include systematic sampling of the glacial overburden for indicator minerals and reinterpretation of aeromagnetic data. Excellent high-resolution aeromagnetic data are available from the Geological Survey of Sweden for most of the country including the Kalix Licence area. The data are complemented by good quality, digital topographic information. The 1996 programme of fieldwork for CMR was concentrated on the

*Core drilling in winter.*

Kalix area relative to the Alnö area, due to the availability of good quality exploration data and its perceived high prospectivity rating.

**Magnetic data interpretation.** CMR commissioned GeoVista AB, a Swedish geophysical consulting company, to reprocess the raw, digital data for the aeromagnetic survey flown in 1968 at a 200 m line spacing and at a height of 30 m. The object of the reprocessing work was to enable the identification of discrete magnetic features possibly related to kimberlites. Kimberlite bodies often contain iron-bearing magnetic minerals, which by high quality aeromagnetic surveys can display "bulls eye", circular anomalies.

In a comprehensive report in July 1996, GeoVista AB identified 52 discrete magnetic features which possibly can be related to kimberlites. The report also outlines a number of dyke-like features. Bulls eye anomalies associated with low topographic features were prioritised for further fieldwork. From nine of these high priority targets excellent local, ground magnetic data could be obtained from the archives at the Mineral Resources Information Office at Malå (Branch office of the Geological Survey of Sweden).

**Heavy mineral sampling and indicator minerals.** From each of the prioritised bulls eye targets a glacial till sample of up to 100 kilograms in weight was collected. The sample site was located "down-ice" and south-east of the magnetic anomaly. After wet sieving in situ, the residue was further separated by the use of a shaking table into a heavy mineral concentrate of less than 1.2 mm grain size. Mineralogical and chemical examination of these samples was made by Diatech Heavy Mineral Services of Perth, Australia.

The results showed the presence of kimberlite and diamond indicator minerals in a high percentage of the samples. Among the minerals identified were pyrope garnets, chromites, picroilmenites, phlogopites and pyroxenes. Detailed chemical analysis of the indicator grains was made by electron microprobe. These results indicate that the minerals studied (pyrope, picroilmenite, chromite) have a kimberlitic origin. Chromerich pyroxenes from two samples are associated with a series of magnetic anomalies in the NW part of the area. These pyroxenes are geochemically close to omphacite in composition. This mineral normally occurs in eclogites and other mantle derived rocks.

In the Kalix area there is no known bedrock provenance, which can generate the indicator mineral grains described above. This further highlights the prospectivity of this region, in particular the local area "up-ice" of the sample locations.

Based on the combined results above five bulls eye targets of particular interest have been defined in the Kalix area, where CMR will carry out further geochemical and geophysical follow up work. These target areas have corresponding magnetic and indicator mineral anomalies and also display topographic depressions. An extensive "follow-up" exploration programme was mounted by CMR in summer 1997, the prime objective being to locate and define drill sites. The results of this survey are expected in spring 1998.

**The Alnö area.** The Alnö complex near Sundsvall, along the Bothnian coast of north-central Sweden, has for more than 100 years been a classical locality for studies of carbonatite petrology. Recent attention of the area has been focused on some rocks, which have a kimberlitic appearance. Mineralogical and chemical studies confirm that these rocks have similar composition as those of kimberlites in South Africa and Siberia. However, research studies in the 1980s which also included some minor bulk-sampling, did not convincingly prove the presence of diamonds in these rocks.

No real diamond exploration of the type which today is carried out by active exploration companies, has been performed in the area before that of CMR.

The Alnö licence block (Västansjö) of interest to CMR is located on the Baltic coastline close to the well known carbonatite of the same name, which was the study of diamond research project mentioned above. Due to the lack of aero-

magnetic data of the region, CMR did not carry out any field work in the licence area in 1996. Airborne geophysical data of this part of Sweden will however be released in 1997 by the Geological Survey of Sweden (SGU) in their continuing mapping process of the country. Regional geochemical information, useful for diamond explorers, can already be obtained from the SGU through their previously published, geochemical maps of the region.

With the information from the ordinary mapping surveys by SGU as a guidance, CMR carried out some detailed geochemical indicator mineral surveys in the Alnö licence area during the 1997 field-season. About 75 samples of glacial till were collected. Results of the surveys are expected early in 1998.

## Rio Tinto Corporation PLC

*(previously Rio Tinto Zinc, RTZ, listed on the London Stock Exchange and other major stock exchanges worldwide)*

**General.** Rio Tinto is the largest mining company in the world with an unrivalled spread of assets in metals and minerals. Its mining interests include copper, gold, iron ore, aluminium, lead, zinc and silver as well as the energy minerals coal and uranium. Other minerals of interests are titanium, borax, talc, diamonds and zircon. The company is based in Bristol in the UK but has offices in almost all continents of the world. The name of the company Rio Tinto was recently introduced in 1997 to mark the transition into one supergiant company through the amalgamation between the two companies RTZ and CRA.

Rio Tinto's exploration activities are fully oriented towards the discovery of world class orebodies (large, high quality mineral deposits). The total exploration budget for 1995 was 178 M USD, which places Rio Tinto on the top of the leading exploration companies in the world. It is calculated that about 50 per cent of the exploration expenditures are directed towards base metals and 50 per cent towards gold and diamonds.

**Exploration in Sweden.** Exploration activities by Rio Tinto in the Scandinavian countries can be traced back to 1982 when BP Minerals started a joint venture with LKAB looking for base and precious metals. Main areas of interests were the Bergslagen district in central Sweden and the Tjåmotis area between Jokkmokk and Kvikkjokk in northern Sweden. In 1988 BP Minerals was acquired by RTZ and the joint venture discontinued.

In 1992/93 the Scandinavian monitoring group within RTZ, in a major exploration review, indicated that the Baltic shield was prospective for diamonds and recommended further work in the region. Work started in Norway in a wholly owned subsidiary looking for diamonds and precious metals. In 1994 exploration also started in Sweden and Finland. The operations in Sweden are run by a Swedish subsidiary based at Malå in the Skellefteå mining district.

During the campaign for diamonds the company identified a number of smaller areas with good prospects. However, at about the same time Alcaston Mining (above) applied for a concession covering all of northern Sweden. In order not to reveal their priority targets, RTZ had to apply for a similarly large area to that of Alcaston. RTZ deposited the impressive sum of 3 M USD to the Mining Registrar in advance for the registration of their diamond concession according to areal fees of the mineral law. Still, the company was only number two behind Alcaston in the waiting line for a granted permission of the diamond concession. With the Alcaston court case continuing over such a long time, RTZ could not wait for the final court decision. In 1996, after two years of waiting, the company decided to withdraw their application for diamonds in Sweden. The deposited registration money was paid back and the company decided to concentrate their exploration activities in Sweden only to precious metals.

## Poplar Resources Ltd *(Listed on the Vancouver Stock Exchange, symbol: PPX-V)*

**General.** Poplar Resources Ltd is a Canadian junior company with a global approach to diamond exploration. The main office is located in Vancouver, B. C. in Canada. Mr Gennen McDowall, a well-known expert in diamond exploration, is president and CEO of Poplar Resources Ltd. Poplar's management has over 20 years of international experience in diamond exploration, previously as employees of some of the world's major diamond companies.

The company currently has a number of exploration projects at various stages of development for diamonds and gold in Sweden, Norway and Finland. Some projects are 100 per cent owned by Poplar, while others are joint venture partnerships. To date, approximately 5.5 M CAD have been spent by Poplar and the company's partners on acquiring and developing these projects. The company also has diamond exploration interests in Ireland and in the James Bay Lowlands of Quebec in Canada. Poplar is currently evaluating three diamond fissure projects in South Africa.

Poplar Resources is linked to Finnmark Mining, which is a 100 per cent subsidiary. North Star Diamonds AS (see below), in which Poplar has a 65 per cent ownership, is a newly formed Norwegian company, which as of November 1, 1997, will continue all of Poplar's diamond exploration activities in the Baltic Shield area. Some directors of Poplar also are partly owning Zappa Resources (ZPA), which is listed on the Vancouver Stock Exchange.

**Exploration in Sweden.** Exploration activities in Sweden by the Poplar group of companies started by Finnmark Min-

*Kimberlitic fissure in Kalix area, Cambridge Mineral Resources´ property.*

ing in 1993/94 with special interests in precious metals prospects and regions in the northern part of the country.

Finnmark Mining presently has relatively large areas claimed in the Tjåmotis region in northern Sweden, where the Kiuri prospects warrant further attention. These areas were earlier partly studied by BP Minerals in the 1980s (see Rio Tinto above).

In 1994, only shortly after the entry by Finnmark Mining, interests by this company in Sweden were focused on diamonds. Gennen McDowall, working for Caledonia Mining, at this time was scanning the high quality digitised data bases (airborne geophysics) of the Geological Survey of Sweden for potential kimberlite areas.

However, the target areas were all located well within the huge area, which just some months earlier had been claimed by Alcaston Mining in their no. 1 diamond claim, which roughly covers all of the northern part of Sweden. So, although a number of local target areas were outlined, McDowall could not reveal those to Alcaston Mining by claiming the specific targets at the Mining Registrar, which officially disclose all claim registrations. Instead, he claimed a large block of similar size to that of Alcaston. As it happened, on the same day as Gennen McDowall registered his application at the Mining Registrar for Caledonia Mining, Alcaston Mining filed their no. 2 diamond licence application covering a similar area to that of Caledonia. Shortly afterwards McDowall left Caledonia Mining and joined Poplar Resources.

Because of the prolonged court case concerning the Alcaston no. 1 diamond licence application, for over two years no important exploration work or evaluations for diamonds were carried out in Sweden by any company.

However changes were to come. The long waiting time for licence approval was too much even for a major company like RTZ, which although it was second behind Alcaston, decided to withdraw their licence application at the Registrar files. This opened up possibilities for Poplar Resources, which in a strategic move in November 1996, bought all Nordic assets from Caledonia Mining (CMC). The deal gave Poplar 100 per cent control of the diamond exploration licence of CMC in Sweden. Apart from the pending diamond claims in Sweden, the total assets acquired included 45 diamond claims in Finland and about 3 000 samples of till ready for processing.

The total Nordic assets of CMC were acquired by Poplar by issuing 3.3 million of Poplar's common shares (valued just under 1 M CAD). Through this deal Poplar raised to the number two position behind Alcaston in the diamond licence file at the Mining Registration Office.

With the Caledonia diamond assets safely in hand, Poplar felt strong enough to contact Alcaston for a possible joint venture for further exploration in northern Sweden. Early discussions were fruitful and on June 23, 1997 Poplar announced that a joint venture agreement between the companies had been signed. Thereby Poplar had finally reached the joint number one position for the future

diamond exploration in Sweden. The alliance has given the 50/50 joint venture partners a significant strategic advantage in this highly prospective region.

To further concentrate its diamond exploration efforts within the Baltic shield area, Poplar announced in October 31, 1997 that all of its Nordic assets, including the pending diamond exploration rights in Sweden, had been transferred to North Star Diamonds AS, a newly formed Norwegian subsidiary company (see below).

By the formation of the subsidiary North Star Diamonds, which will continue the work of Poplar in the Baltic Shield, Poplar will from now on concentrate its efforts on diamond exploration and development projects primarily in South Africa.

## North Star Diamonds AS

*(Unlisted Norwegian junior exploration company)*

**General.** North Star Diamonds AS is a fully-funded Norwegian subsidiary company to Poplar Resources. The company was formed in September, 1997 and is registered in Oslo, but has offices in Stockholm (Huddinge) in Sweden and at Oulu in Finland, where laboratory and storage facilities are installed for treatment of geochemical overburden samples. A group of Norwegian investors have acquired a 35 per cent equity interest in North Star Diamonds in exchange for 5.5 million NOK. This arrangement leaves Poplar with a controlling 65 per cent interest in North Star Diamonds.

North Star Diamonds has an exciting and competent management with long-time experience in diamond exploration in most places of the world as well as an excellent background in exploration within the Baltic Shield region. Dr Jan-Ola Larsson, a well-known geochemist and formerly Regional Manager and Division Head of the Geological Survey of Sweden, has been newly appointed General Manager. The staff also includes Gennen McDowall from Poplar as well as highly qualified geologists.

By acquiring all Nordic assets from Poplar Resources, North Star Diamonds has a strong portfolio of 45 diamond exploration licences in Finland (with results from various stages of follow up surveys) and a pending application for diamond exploration rights of the northern half of Sweden (270 000 $km^2$). The Swedish project is being pursued with Alcaston Mining of Australia as a 50/50 joint-venture partner.

**Exploration in Sweden.** Diamond exploration in Sweden was carried out by Poplar Resources up until October 1997. As of that time all of Poplar's exploration activities in Sweden and other Nordic countries are being pursued by North Star Diamond AS (NSD). NSD is also the operator in the present joint venture exploration programme between Alcaston and Poplar Resources.

NSD has adopted a unique technique developed by Poplar Resources (Gennen McDowall) to identify and delineate diamondiferrous kimberlite/lamproite areas known as "Corridors of Hope".

This strip methodology has been successfully applied and demonstrated in regions in Finland and in the Archangels kimberlite province in Russia. The method defined as the "Kimberlite Strip Model", substantially reduces the size and costs of areas to be explored.

The model uses a suite of geological and geophysical tools to identify and delineate areas, where diamondiferrous kimberlite pipes are most likely to occur. NSD/Poplar has identified three Kimberlite strips that run through the Baltic Shield including Sweden, Norway, Finland and Russia.

Using the "Kimberlite Strip Model" in combination with high quality aeromagnetic data obtained from the Geological Survey of Sweden, North Star Diamonds has already defined a number of target areas in northern Sweden. Within the identified, priority targets more than 300 overburden samples were collected during the summer season in 1997. These samples are presently being processed and analysed at the Cape Town Mineralogical Laboratory of Prof. John Gurney, the world's leading authority on the chemistry of diamond indicator minerals. Results from this study are expected in March 1998.

In December 1997 Poplar/NSD announced that an agreement has been entered with two local prospectors, who have found macro diamonds in a glacial till boulder located within NSD's sampling area in northern Sweden. As part of the agreement the prospectors have provided NSD with the exact location of the find as well as provided the company with the diamonds and the host material for analysis. In return for their information the prospectors have been paid a small fee and will earn some royalty in any future diamond mine resulting from their discovery.

Six diamonds have been found. Three of these were sent for analysis and have been positively identified by assistance of the Camborne School of Mines in the UK. The largest diamond identified is 2.0x1.3 mm and slightly yellowish in colour. The diamonds are the first which have been found in Sweden and the find confirms the large diamond potential of the country. As it turns out the lamproite boulder was located within 100 metres of NSD's glacial overburden sampling sites mentioned above. The boulder, which appears to be a piece of lamproite, is a very rare find. Normally boulders of this rock type would not withstand the mechanical erosion of a moving glacial ice, but would quickly disintegrate in small pieces. In this case the finding indicates a very local source in up-ice direction. Naturally the find has greatly advanced the joint venture exploration programme in the region.

The company is presently updating its exploration strategy for 1998. If a positive solution is obtained of the present pending licence application at the Supreme Court of Appeal the joint venture

partners with NSD as the operator, might well consider a late winter drilling in 1998 of local targets in the up-ice direction of the boulder find.

## Geoforum Scandinavia AB

*(Unlisted Swedish junior exploration company)*

**General.** Geoforum Scandinavia AB is a junior company based at Ludvika in the Bergslagen mining district of central Sweden. The company, formed in 1991, is led by Mr Michael Bromley-Challenor, who has a long background in exploration in Sweden.

Many of the employees of Geoforum have worked together as a team since 1997. The staff disciplines include geology, geochemistry, geophysics and mining geology. The company has an equipment backup which include light weight drill rigs as well as facilities to process overburden samples through to the prelaboratory, heavy mineral concentrate stage.

**Exploration in Sweden**. In the Bergslagen area of Sweden the company has worked with major companies on base and precious metal exploration programmes as well as in operating mines.

In 1996 Geoforum extended its interests to diamonds. The company has applied for a diamond exploration permit covering an area of 110 000 square kilometres in northern Sweden. The area covers the same areas as those of Alcaston and Poplar mentioned above. Geoforum is number three on file in the diamond exploration registration at the Mining registrar. Like all other companies Geoforum is awaiting the outcome of the present court case on the Alcaston application.

In the summer season of 1996 Geoforum started geochemical characterisation studies of kimberlite indicator minerals as part of the company's diamond exploration surveys. The company is also reviewing airborne geophysical data covering part of the areas of interest.

Presently Geoforum is looking for a suitable partner, who has achieved diamond exploration success in areas of similar geological environments.

## Summary

An early operator in diamond exploration in the country has been the Australian company Ashton Mining Ltd, which started exploration in Sweden in 1988. In 1993 this company was joined by Alcaston Mining from Australia and Rio Tinto Zinc (today Rio Tinto) from the UK. Other companies with diamond interests in Sweden are Caledonia Mining Corporation (CMR) and Poplar Resources from Canada as well as Cambridge Mineral Resources from the UK. The Swedish junior company Geoforum AB is also taking part in the Swedish diamond hunt.

Lately the operator scene of diamond exploration in Sweden has changed quite dramatically. Through business negotiations in 1996–97 Poplar Resources has become a formidable player in the future hunt for diamonds in Sweden. First, the company made an acquisition agreement with Caledonia Mining Corporation (CMC), which gives Poplar Resources a 100 per cent interest in all CMC's Nordic assets. Through this agreement Poplar reached the second position behind Alcaston Mining in the waiting list for the approval of a diamond licence at the Swedish Mining Inspector registration office. Alcaston is awaiting a decision for their enormously large diamond licence covering the whole of northern Sweden. Second, in June 1997 Poplar announced that it had formed a joint venture with Alcaston to explore for diamonds in Sweden. This alliance gives the companies a significant strategic advantage in the Swedish diamond industry.

Poplar's total Nordic assets have recently (October 1997) been transferred to a Norwegian registered subsidiary, North Star Diamonds AS, which will continue the future exploration activities for Poplar Resources.

The assets of North Star Diamonds presently consist of a strong portfolio of 45 diamond exploration licences in Finland (with results from various stages of follow up surveys) and a pending application for diamond exploration rights of northern half of Sweden. The Swedish project is being pursued with Alcaston Mining of Australia as a 50/50 joint venture partner. The joint venture is today in the possession of the first diamonds which have been found in Sweden. The diamonds were sitting in glacial boulder, which was found by two local prospectors. Through an agreement with these prospectors the exact locality has been shown to the company. The find has greatly advanced the joint venture exploration programme in the region. ■