

## **The Ekati and Diavik Discoveries – Canada’s Entry to Global Diamond Production**

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### **Introduction**

The exciting discovery of diamondiferous kimberlites in Canada’s Northwest Territories (NWT) 30 years ago triggered a massive staking rush culminating in the opening of the world class Ekati and Diavik diamond mines. Canada has produced more than three hundred million carats from 1998 through 2023 from mining operations in the NWT (Ekati, Diavik, Gahcho Kue and Snap Lake), Nunavut (Jericho), Ontario (Victor) and Quebec (Renard) and still is a significant global diamond producer. More than three quarters of Canada’s rough diamond production to date has been recovered from open pit and underground mining operations at the NWT Ekati and Diavik diamond mines.

### **Discovery to Mine Opening - Ekati Diamond Mine**

The discovery of Ekati Diamond Mine started with a field program to evaluate the diamond potential of the Mountain Diatreme located in the MacKenzie Mountains, NWT. The 1981 program was conducted as part of a joint venture between Superior Minerals, Falconbridge, and CF Minerals (Chuck Fipke) and under the direction of Hugo Dummett of Superior. This early venture also included Stewart Blusson who assisted with the sampling programs. Competitor activity at the time included De Beers’ subsidiary Diapros which was exploring south of Norman Wells near Blackwater Lake. After completing the planned exploration program, stream sediment samples were collected in the vicinity of Blackwater Lake. Significant counts of kimberlite indicator minerals were only recovered in the Blackwater Lake area samples and the field team returned in 1982 for a follow up program (Fipke et al, 1995a).

Fipke and Blusson surmised that the Blackwater area kimberlite indicator minerals had been transported westward by glacial movement from the Slave Craton. In summer 1983, they conducted a regional sampling program eastward to the Lac la Martre area. New funding for the search was obtained in 1984 when Dia Met Minerals was listed as a publicly traded company. In August 1985, Fipke collected follow up till and esker samples using float planes based out of Yellowknife. Three samples collected north of Lac de Gras had extremely high counts of kimberlite indicator minerals; few indicator minerals were recovered within samples collected east of the Lac de Gras area (Fipke et al, 1995a).

Follow up sampling in 1988 better defined the extent of the strongly anomalous samples and Dia Met began staking claims in 1989. The dataset of indicator mineral geochemistry within the claim area was evaluated independently for Dia Met in May 1990 by John Gurney and Rory Moore who concluded that the indicator minerals originated from highly diamondiferous kimberlite sources (Fipke et al, 1995b). BHP Utah Intl. signed the Core Zone Joint Venture agreement with Dia Met, Fipke and Blusson on September 5, 1990.

In early 1991, BHP Utah geophysicist Ray Ashley completed ground magnetometer and Max-Min (horizontal loop electromagnetic) lines over Point Lake where indicator minerals with diamond inclusion compositions had been recovered by Fipke one year earlier. Results from the Max-Min survey showed a pipe-like signature. Dighem was then contracted to fly a helicopter-borne geophysical survey including magnetic and multi-frequency EM sensors. It proved to be the breakthrough for detecting kimberlite pipes in glacial terrain. More claims were staked bringing the land position to 3,354 square kilometers.

The discovery drill hole at Point Lake was collared in September 1991 based on the strong conductivity anomaly which was evident in the ground and airborne geophysical surveys. Kimberlite was subsequently intersected, and the ensuing announcement that small diamonds (up to 2 mm) had been recovered from the drill core sparked the historical staking rush. 160 tonnes of kimberlite were extracted from the Point Lake pipe in early 1992 using reverse circulation drilling. Results were encouraging in terms of diamond grade, but the recovered diamonds were of overall low quality. Attention quickly shifted to discovery of more kimberlite pipes. Airborne geophysical surveys were soon flown over the claims and ground geophysical surveys were primarily used along with geochemistry to screen the drill targets (Carlson et al, 1999).

Twenty-two kimberlite pipes were drilled during the 1992/1993 field seasons including the Fox, Koala, Misery and Panda pipes which would prove to be economic. Prioritization of the kimberlites for bulk sampling was done with microdiamond and mineral chemistry analysis of drill core. Bulk sampling and delineation/geotechnical drilling programs were completed on the most prospective pipes. Exploration continued and by the time of the mine opening, more than one hundred kimberlites had been drilled.

The NWT Diamonds Project Description Report was filed by BHP in December 1994. This was followed by an environmental impact study (EIS) in 1995. Construction of the mine began in 1997 after reaching an environmental agreement with the Canadian Government and the Government of the Northwest Territories and signing of the Indigenous Impact and Benefit Agreements. The official opening of Ekati Diamond Mine was October 14, 1998, with open pit mining operations at the Panda kimberlite pipe.

Ekati currently includes 122 mining leases (1,135 sq km). Ekati Diamond Mine has produced over 96 million carats from 1998 through 2023 and is now owned and operated by Burgundy Diamond Mines Ltd.

### **Discovery to Mine Opening - Diavik Diamond Mine**

Within two weeks of the November 1991 Dia Met Point Lake diamondiferous kimberlite announcement, Aber Resources and Monopros (subsidiary of De Beers) were independently staking claims adjoining the Dia Met/BHP claim block and Canada's greatest diamond land rush was underway. Aber's efforts were funded by a private exploration company, West Viking Exploration Ltd. and were focused on the ground up-ice (east) of the Dia Met/BHP claims and on the closest available ground to the Point Lake discovery. Through a series of transactions with other junior exploration companies, the Diavik land package was expanded to about 3,250 square kilometers by mid 1992. The first option agreement between Aber and Kennecott Canada covering the Diavik property was completed in June 1992 (Varas et al, 1994).

Aber started exploration efforts early in 1992 (April – May) by contracting Geonex Aerodat Inc. to fly an orientation survey (helicopter-borne magnetic and EM surveys) over Point Lake followed by a 20,500-line km airborne geophysical survey over the Diavik property. 437 magnetic and EM anomalies were classified by Geonex Aerodat Inc. for possible follow up (Varas et al, 1994).

Heavy mineral sampling (n=1700) during 1992 and 1993 provided initial property scale coverage as well as targeted work over 250 airborne geophysical anomalies. Ground geophysical surveys (total field magnetic and horizontal loop EM) were conducted to define selected airborne targets for drill testing. Diamond drilling (primarily magnetic anomalies) confirmed twenty-five kimberlite pipes in 1992 and 1993.

Most of the drill targets had weak or no indicator mineral dispersion. However, extremely high indicator mineral counts were obtained from samples collected on an island in Lac de Gras down-ice (northeast) from the A21 airborne geophysical anomaly (Varas et al, 1994).

Ground geophysical surveys in early 1994 included magnetics, gravity, and EM. The first economic pipe, A21, was discovered in April 1994, followed shortly by A154 South in May. A large gem quality diamond (known as the “Aber Diamond”) was recovered from the discovery drill core of the A154S pipe, and this led to expanded exploration and evaluation efforts. The A154N pipe was drilled in the fall of 1994 from a barge drill platform and A418 was drilled in spring 1995 (Graham et al, 1999). All four kimberlites were situated under the waters of Lac de Gras, displayed distinct EM signatures, and produced microdiamond and indicator mineral results indicative of strong diamond grade potential (Brett et al, 2018).

The Diavik Joint Venture agreement between Aber and Kennecott was signed on March 23, 1995. A preliminary economic study commenced and included large diamond core (LDC) drill holes in A154S/A154N and delineation core holes. A pre-feasibility study completed in September 1997 included more large diameter core drilling and delineation drilling as well as underground bulk sampling of the A154S and A418 pipes. The diamond grade and price estimates for A154S and A418 were comparable to the world’s richest diamond mines and engineering/planning work was accelerated (Brett et al, 2018).

The Diavik Diamonds Project Environmental Assessment was submitted in September 1998 and later approved by the federal minister of the environment. This was followed by ratification of the Socio-Economic Monitoring Agreement. In March 2000, the Environmental Agreement was signed, and permits were issued to allow commencement of construction in 2001. A 3.9 km long water retention dike was built around the planned site of the A154 open pit. After dewatering the pool within the dike, lake-bottom sediments and till overburden were removed and mining and processing of kimberlite from the A154 open pit was soon underway (Brett et al, 2018). The Diavik Diamond Mine officially opened July 21, 2003.

Diavik currently comprises 153 mining leases (1,340 sq km) and is owned and operated by Rio Tinto. Since opening in 2003 through 2023, Diavik has produced more than 144 million carats.

## References

- Brett R, Kinakin Y, Howell D, Davy A (2018) Exploration history and discovery of the Diavik diamond deposits, Northwest Territories Canada. In: Davy A, Smith C, Helmstaedt H, Jacques A, Gurney J (eds) Society of Economic Geologists Inc., Special Publication 20, pp. 253-265
- Carlson J, Kirkley M, Thomas E, Hillier W (1999) Recent Canadian kimberlite discoveries. In: Gurney J, Gurney JL, Pascoe M, Richardson S (eds) Proceedings of the VIIth International Kimberlite Conference, Vol. 1, Red Roof Design, Cape Town, pp. 81-89
- Fipke C, Dummett H, Moore R, Carlson J, Ashley R, Gurney J, Kirkley M (1995a) History of the discovery of diamondiferous kimberlites in the Northwest Territories, Canada. In: Sobolev N (ed) Extended Abstracts, Sixth International Kimberlite Conference, United Institute of Geology, Geophysics and Mineralogy, Siberian Branch of Russian Academy, Novosibirsk, pp. 158-160
- Fipke C, Gurney J, Moore, R (1995b) Diamond Exploration Techniques Emphasizing Mineral Chemistry and Canadian Examples. Geological Survey of Canada, Ottawa, Bulletin 423
- Graham I, Burgess J, Bryan D, Ravenscroft P, Thomas E, Doyle B, Hopkins R, Armstrong K (1999) Exploration history and geology of the Diavik kimberlites, Lac de Gras, Northwest Territories, Canada. In: Gurney J, Gurney JL, Pascoe M, Richardson S (eds) Proceedings of the VIIth International Kimberlite Conference, Vol. 1, Red Roof Design, Cape Town, pp. 262-279
- Varas P, Johnson M, Mosher B, Thomas E (1994) Diavik Project: 1992 and 1993 geophysics, heavy mineral sampling, and diamond drilling report. Assessment Report, NWT Mining Recorder, Yellowknife