

New Québec and Torngat Orogens, Southeast Churchill Province (Core Zone), and Ungava Orogen

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Introduction

Composed mainly of Paleoproterozoic rocks, the New Québec (Labrador Trough), Torngat, and Ungava (Cape Smith Belt) orogens cover a significant proportion of northern Québec (figures 1D-1 and 1D-2). The Southeastern Churchill Province includes the New Québec and Torngat orogens and their hinterland (core zone, composed largely of Archean rocks and sometimes referred to as the Rae Province [James *et al.*, 1996; Wardle *et al.*, 2002] [Figure 1D-1]).

The main targeted commodities in the New Québec Orogen and the core zone in 2004 were copper, nickel, platinum group elements (PGE), zinc, and cobalt. The search for diamonds generated some interest in the Torngat Orogen (Figure 1D-1). The Ungava Orogen (Ungava Trough or Cape Smith Belt) once again attracted several exploration companies in the search for nickel, copper, and PGE. All exploration projects conducted by exploration companies and individual prospectors within the study area are listed in Table 1D-1.

New Québec Orogen

GEOLOGICAL OVERVIEW

Also referred to as the Labrador Trough in Québec, or simply “the Trough”, the New Québec Orogen, with rocks dated from 2.17 to 1.79 Ga, forms a fold and thrust belt along the margin of the Superior Province (Clark and Wares, 2004). The Trough is composed of rocks comprising two volcano-sedimentary cycles and a third cycle of metasedimentary rocks (Clark and Wares, 2004).

SEDIMENT-HOSTED URANIUM

The Labrador Trough is known for its sediment-hosted uranium deposits. Clark and Wares (2004) described four deposit types: unconformity-related deposits, sandstone-hosted stratiform deposits, stratiform deposits in mudstones and siltites, and carbonate-hosted stratiform deposits. In 2005, **Waseco Resources Inc.** acquired five properties that contain numerous known uranium occurrences (project 1, Figure 1D-1). The company proceeded with a compilation of previous work and an interpretation of magnetic, gravity, and radiometric survey results, which led to the identification of several uranium anomaly zones, most of which are km-scale. Previous work on

the property indicates significant uranium grades (up to 38% U, 0.10% U over 1 m; Clark and Wares, 2004).

Torngat Orogen and Southeast Churchill Province (core zone)

GEOLOGICAL OVERVIEW

The Paleoproterozoic Torngat Orogen is bounded to the east by Archean rocks of the Nain Province and to the west by Archean and Paleoproterozoic rocks of the core zone (Figure 1D-1). This orogen is divided into lithotectonic domains and complexes separated by ductile shear zones (*e.g.*, the Abloviak deformation zone, Figure 1D-1).

Located in the Southeastern Churchill Province, the Trough hinterland and the Torngat foreland were called the “core zone” by James *et al.* (1996). The core zone is composed largely of Archean gneisses with bands of Paleoproterozoic supracrustal rocks. These rocks were subsequently deformed and metamorphosed during the Paleoproterozoic. The core zone is divided into a series of lithotectonic domains separated by wide deformation zones (Figure 1D-1; Wardle *et al.*, 2002).

DIAMOND

In 2005, **Diamond Discoveries International Corp.** conducted a multiphase field campaign on its Torngat diamond project. Three boreholes totalling 500 m were drilled to test a kimberlitic body discovered in 2004 (project 14, Figure 1D-1). Results of the 2005 campaign are still pending.

Ungava Orogen

GEOLOGICAL OVERVIEW

The Paleoproterozoic Ungava Orogen (Ungava Trough or Cape Smith Belt) consists of a volcano-sedimentary belt that stretches over some 370 km along an ENE-WSW axis (St-Onge and Lucas, 1990; Figure 1D-2). The area may be divided into four main tectonic units: a) the autochthonous Archean basement of the Superior Province, b) the allochthonous accretionary belt or Ungava Trough *s.s.*, c) the Paleoproterozoic Narsajuaq Terrane, and d) the parautochthonous Archean basement (Lamothe, 1994). The Ungava Orogen comprises seven tectonostratigraphic units that form the Southern and Northern lithotectonic domains, separated by the Bergeron fault. The Southern Domain is composed of three groups: a) the Lamarche Group (sedimentary assemblage intruded by gabbro sills), b) the Povungnituk Group (tholeiitic basalts intercalated with detrital sediments), and c) the Chukotat Group (komatiitic to tholeiitic basalts) thrust onto the Povungnituk. The Northern Domain consists of the Chassé Formation (detrital unit) and of four groups: a) the Watts Group (sedimentary and metavolcanic rocks), b) the Parent Group (tholeiitic basalts and tuffs), c) the Spartan Group (psammites, pelites, semipelites, sandstones,

felsic tuffs, and mudstones), and d) the Perrault Group (wackes, conglomerates, sandstones, and mudstones).

MAGMATIC NI-CU-CO-PGE DEPOSITS

Since 1998, the **Société minière Raglan du Québec**, a wholly-owned subsidiary of **Falconbridge Ltd**, operates an underground and open pit mine, extracting ore from several Ni-Cu-PGE deposits in the Raglan mining camp (project 17, Figure 1D-2). The mining camp comprises a series of 19 massive sulphide lenses (including the Katinniq deposit). **Falconbridge Ltd** uncovered a new zone, Zone 5-8, where a 44.65-m section from Lens 8H yielded assays of 3% Ni and 0.94% Cu. This new zone, located 5 km east of the Katinniq mill (project 18, Figure 1D-2), represents an eastward extension of the Raglan mining camp.

Since 2002, **Canadian Royalties Inc.** has been jumping from one discovery to the next and has stepped up its exploration efforts for nickel, copper, and platinum group elements (PGE) in the Ungava Orogen. Many of its showings and deposits have been drill-tested. Mineral resource estimates have been calculated for a few deposits, namely the Mesamax deposit (project 19, Figure 1D-2), where indicated resources stand at 1.848 Mt grading 1.9% Ni, 2.3% Cu, and 5.0 g/t PGE, and the Mequillon deposit where indicated resources are estimated at 4.185 Mt at 0.6% Ni, 0.9% Cu, and 3.3 g/t PGE (project 20, Figure 1D-2). A drillhole testing the latter deposit (MNQ-05-105) intersected 57.7 m grading 1.02% Ni, 1.32% Cu, 0.1 g/t Au, and 4.4 g/t PGE. The Tootoo zone discovered in 2003 was also drill-tested; a 9.8-m intercept yielded assays of 3.2% Ni, 2.91% Cu, 0.21 g/t Au, and 4.32 g/t PGE (project 21, Figure 1D-2). In December, **Canadian Royalties Inc.** (project 21, Figure 1D-2) announced the discovery of a new mineralized zone located 200 m west of the Tootoo showing. A 19-m section in the Tootoo West zone yielded grades of 1.10% Ni, 1.06% Cu, and 6.51 g/t Pt+Pd+Au (drillhole TT-05-58). This zone also contains a higher-grade interval of 2.88 m grading 26.75 g/t Pd, 4.27 g/t Pt, 2.88% Ni, and 2.91% Cu. In September, the company announced another discovery on the Ivakkak zone (project 22, Figure 1D-2). This Ni-Cu-PGE zone, located about 23 km west of the Mequillon deposit and 50 km west of the Mesamax deposit, is associated with Raglan-type ultramafic rocks. Holes drilled by the company intersected massive to disseminated sulphides. Core samples from drillhole IV-05-01 yielded average grades of 2.34% Ni, 3.25% Cu, 0.10% Co, 0.5 g/t Au, 1.6 g/t Pt, and 6.2 g/t Pd over 12 m. At the Expo deposit (project 23, Figure 1D-2), **Canadian Royalties Inc.** uncovered several new zones (Northeast Area, Eastern Limit, Main Body, and New South zones, project 23, Figure 1D-2), where preliminary results indicate grades reaching 2.96% Ni, 1.96% Cu, 4.14 g/t Pt, and 4.48 g/t Pd. Indicated resources are estimated (based on 2004 drill data) at 4.45 Mt grading

0.8% Ni, 0.8% Cu, and 1.8 g/t PGE, with inferred resources of 645,000 tonnes at 1.8% Ni, 1.5% Cu, and 3.2 g/t PGE. According to the company, total resources for deposits on the Raglan South Nickel project now stand at more than 10 Mt. **Goldbrook Ventures Inc.** and **Anglo American Exploration (Canada) Ltd** discovered two new Ni-Cu zones on the Bélanger property, namely the Pad1/R2 zone and the Timtu zone (project 24, Figure 1D-2). Drillcore samples from the Pad1 zone yielded grades of 0.85% Ni, 1.49% Cu, and 1.28 g/t Pt+Pd over 24.73 m (drillhole BEL05-005). Nickel grades are higher in the Timtu zone, where an 8.65-m interval yielded grades of 1.01% Ni, 0.63% Cu, and 2.38 g/t Pt+Pd (drillhole BEL05-003). Joint venture partners **Anglo American Exploration (Canada) Ltd** and **Knight Resources Ltd** conducted an important exploration campaign on the West Raglan property, which namely included 29 drillholes totalling 4,771 m. Drillcore samples yielded interesting assays over several different intersections, including two in the Greater Frontier area (project 25, Figure 1D-2). A 12.9-m section yielded grades of 0.67% Ni, 0.39% Cu, and 0.58 g/t PGE (drillhole WR-05-98). In another drillhole (WR-05-100), a 7.80-m section graded 2.16% Ni, 0.68% Cu, and 1.53 g/t PGE.

Opportunities for Exploration

Clark and Wares (2004) compiled more than 336 mineral occurrences in the New Québec Orogen. We invite the reader to consult this synthesis, which contains a comprehensive overview of the main ore deposit types occurring in the New Québec Orogen. According to the authors, the most promising uranium occurrences associated with mudstones and siltites, are related to the thickest zones in argillaceous sequences, which constitutes a good ore guide. Sandstones encountered near lakes Otelnuc and du Portage are highly prospective, and the uranium potential of the Chioak Formation, in the northern part of the Trough (Bérard zone; Clark and Wares, 2004), is also interesting. The Lac Retty and Lac Gerido areas are known to host massive and disseminated sulphide deposits in mafic to ultramafic sills (Clark, 1994). Although known Cu-Ni occurrences in these areas are low-grade, additional lenses may be discovered through additional exploration. Therefore, these represent excellent target areas to discover new magmatic Cu-Ni-PGE deposits. According to Clark (personal communication), the northernmost part of the Labrador Trough (NTS 25D/01, ex.: Qarqasiaq zone where grades reach 6.5% Ni and 2.28 g/t PGE) offers a strong potential for Cu-Ni mineralization given the abundance of high-magnesium rocks (picrites) and strong similarities with the Cape Smith belt (relative proximity of known deposits in the Cape Smith belt, presence of magne-sian lavas and metal-rich sulphides).

1D

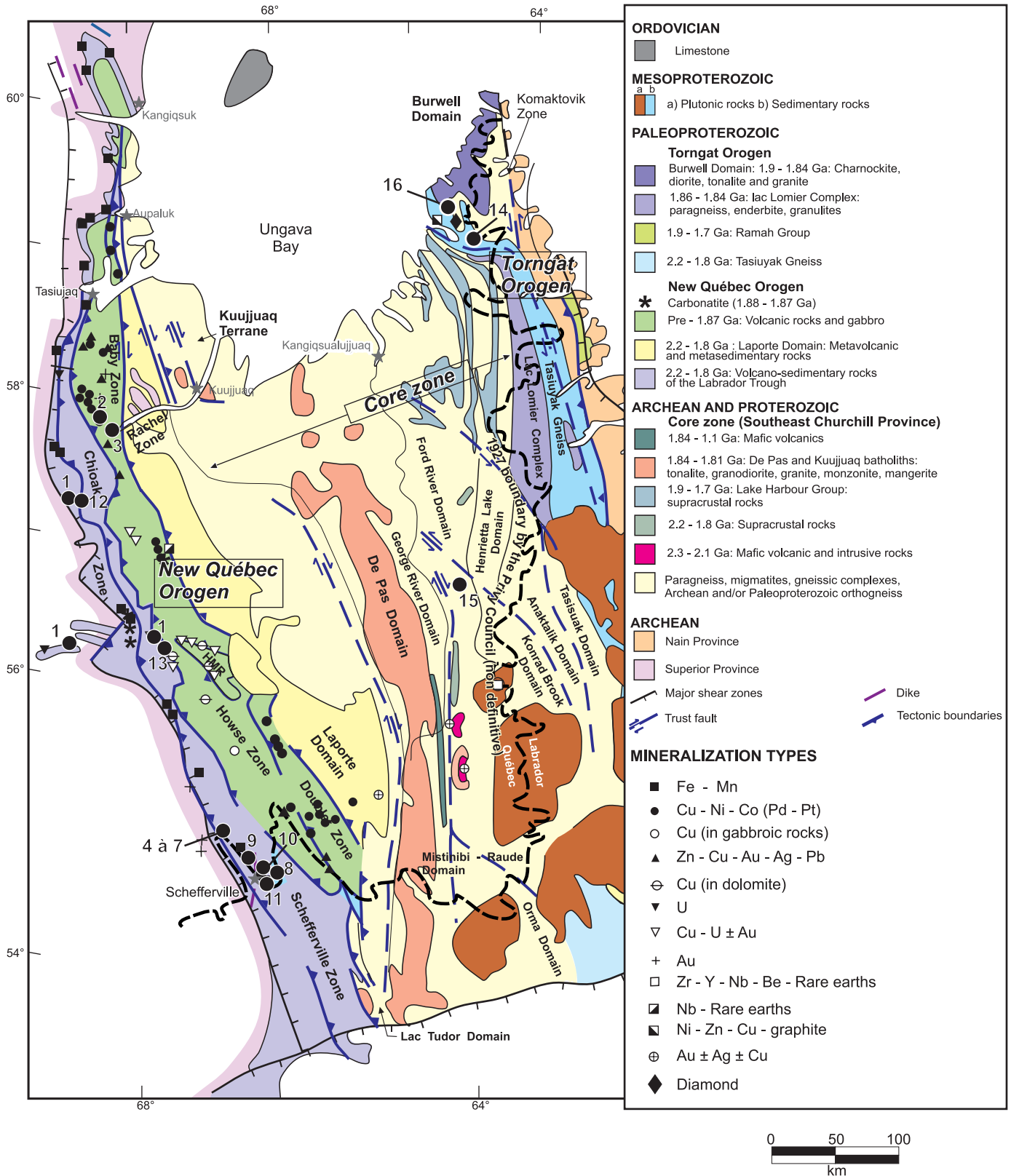
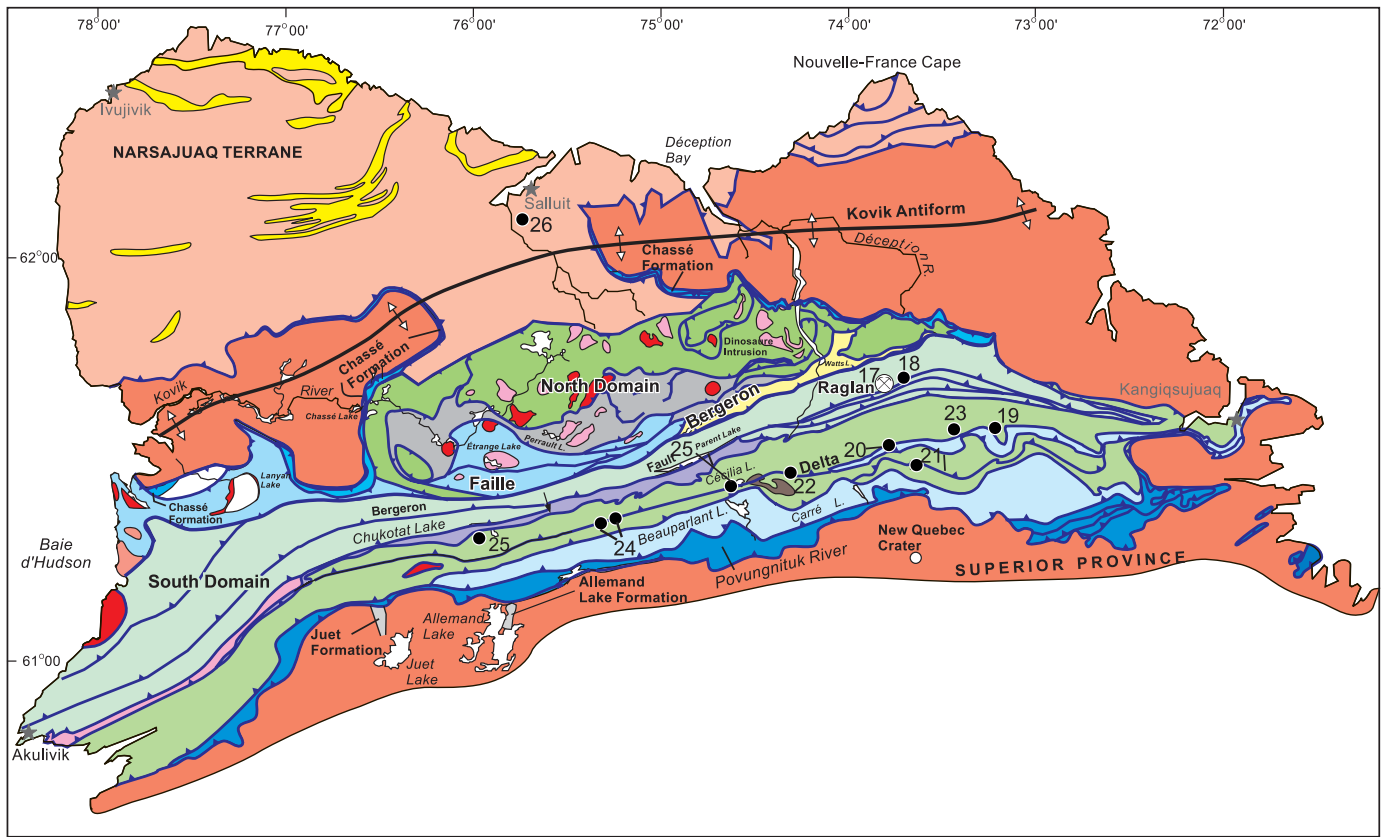
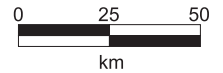


Figure 1D-1. Mineral exploration projects in New Québec and the Torngat orogen, the core zone and the Ungava Orogen for 2005. Modified from Wardle *et al.*, 1990 and 2000.

1D



UNGAVA OROGEN



NORTH DOMAIN

- Perrault Group**
Wacke, conglomerate, sandstone, mudstone
- Spartan Group**
Psammites, pelites, felsic tuff, dolomite
- Parent Group**
Pyroclastites, basalt, rhyodacite, rhyolite
- Watts Group**
Peridotite, pyroxenite, gabbro, basalt
- Chassé Formation**
Quartzite, psammites
- Intrusive rocks**
Granite, granodiorite, monzodiorite
- Gabbro, tonalite, diorite, peridotite, pyroxenite

SOUTH DOMAIN

- CHUKOTAT GROUP**
Basalt
- POVUNGNIK GROUP**
 - Nuvilic Formation**
Psammites, carbonates, pyroclastites, basalt
 - Cecilia Formation**
Basanite, phonolite
 - Beauparlant Formation**
Basalt, rhyolite
 - Dumas Formation**
Psammites, pelites, basalt

LAMARCHE GROUP

- Psammites, dolomite, iron formation, pelites

INTRUSIVE ROCKS

- Granite, granodiorite, monzodiorite
- Gabbro, peridotite, pyroxenite

NARSAJUAQ TERRANE

- INTRUSIVE ROCKS**
Tonalite, quartz diorite, granite, monzonite, syenogranite

SUGLUK GROUP

- Sempelite, quartzite

ARCHEAN BASEMENT

- Granodiorite, granite, quartz diorite, tonalite, psammites, iron formation, pyroclastites, basalt

- Lithological contact
- Trust fault

- Mines

Figure 1D-2. Exploration projects in the Ungava Orogen for 2005. Modified from Lamothe (1996).

TABLE 1D-1 - Mineral exploration projects in New Quebec, Torngat Orogens, core zone and Ungava Orogen for 2005.

Nos.	NTS	COMPANIES / PROSPECTORS	PROJECTS	SUBSTANCES	WORKS ⁽¹⁾
New Québec Orogen, figure 1D-1					
1	24 C/04, 24 C/08, 24 F/04	Waseco Resources Inc.	Uranium Properties	U	GpCr, GpMa, GpRa
2	24 F/13, 14	Fonds d'Exploration Minière du Nunavik	Projet Willibob	Au	Pr, S
3	24 F/13, 14	Fonds d'Exploration Minière du Nunavik	Projet Hélico	-	Pr, S
4	23 O/03	New Millennium Capital Corp.	Goodwood	Fe	G, S
5	23 O/03	New Millennium Capital Corp.	Keough Lake	Fe	G, S
6	23 O/03	New Millennium Capital Corp.	Lac Thérèse	Fe	G, S
7	23 O/03	New Millennium Capital Corp.	Harris Lake	Fe	G, S
8	23 J/15	New Millennium Capital Corp.	Knob Lake	Fe	G, S
9	23 J/14	New Millennium Capital Corp.	Barney	Fe	G, S
10	23 J/15	New Millennium Capital Corp.	Ferriman	Fe	G, S
11	23 J/10, 15	New Millennium Capital Corp.	Malcolm	Fe	G, S
12	24 F/04, 05	Uranor Inc.	Trimac	U	Gs(tr), Pr
13	24 C/07	Uranor Inc.	Minowean	U	GpRa(S), Gs(tr), T
Core zone and Torngat Orogen, figure 1D-1					
14	24 P/07	Diamond Discoveries International Corp.	Torgat	Diamond	D(3:500), G, GpMa, Pr, S
15	24 A/15	Inco Ltd	Ferriault	Ni	Pr, S
16	24 P	Uranor Inc.	Cage	U	Pr, S
Ungava Orogen, figure 1D-2					
17	35 H/11, 12	Société Minière Raglan du Québec / Falconbridge Ltd	Raglan	Cu-Ni-Co	D(244:73357), G, GpEm(A;G), Pr, S
18	35 F, G, H	Falconbridge Ltd	Zone 5 - 8	Ni-Cu-PGE	D(?:?), G, S
19	35 H/11	Canadian Royalties Inc.	Mesamax	Ni-Cu-PGE	D(40:??), Re
20	35 H/11, 12	Canadian Royalties Inc. / Ungava Minerals Corporation	Mequillon	Ni-Cu-PGE	D(75:?), G, GpMa, Pr, Re, S
21	35 H/11, 12	Canadian Royalties Inc.	Tootoo Zone	Ni-Cu-Pd-Pt	
	35 H/11, 12	Canadian Royalties Inc.	- Zone West	Ni-Cu-Pd-Pt	D(11:?)
	35 H/11, 12	Canadian Royalties Inc.	- Zone principale	Ni-Cu-Pd-Pt	
22	35 G/08	Canadian Royalties Inc. / Montoro Resources Inc.	South Trend Prospect (zone Ivakkak)	Cu-Ni-PGE	D(?:3839), G, GpMa, GpEm(G), Pr
23	35 H/11	Canadian Royalties Inc.	Gîte Expo	Ni-Cu-PGE	D(32:6200), S
	35 H/11	Canadian Royalties Inc.	- North est area	Ni-Cu-PGE	
	35 H/11	Canadian Royalties Inc.	- Eastern Limit	Ni-Cu-PGE	
	35 H/11	Canadian Royalties Inc.	- Main Body	Ni-Cu-PGE	
	35 H/11	Canadian Royalties Inc.	- New South Zone	Ni-Cu-PGE	
24	35 G/06	Goldbrook Ventures Inc. / Anglo American Exploration (Canada) Ltd	Bélanger (Pad 1/R2; Timtu)	Ni-Cu-PGE	D(18:2700), G, Gs(sl), Gs(t), GpEm(B;G), GpMa, Pr

TABLE 1D-1 - Mineral exploration projects in New Quebec, Torngat Orogens, core zone and Ungava Orogen for 2005.

Nos.	NTS	COMPANIES / PROSPECTORS	PROJECTS	SUBSTANCES	WORKS ⁽¹⁾
25	35 C/05, 06, 35 F/08	Anglo American Exploration (Canada) Ltd / Knight Resources Ltd	West Raglan (Greater Frontier)	Ni-Cu-PGE	D(29:4771), G, Pr, S
26	35 J/04	Fonds d'Exploration Minière du Nunavik	Projet 3-granites	Au-Cu	Pr, S

1 = See abbreviation list in appendix II.