# GM 43660

GEOLOGICAL COMPILATION REPORT,  CASA BERARDI - JOUTEL REGION PROPERTY

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Énergie et Ressources naturelles
Québec

# GEOTEST CORPORATION
# GEOLOGICAL COMPILATION
# REPORT
# ON THE
# CASA BERARDI - JOUTEL REGION
# PROPERTY

JOUTEL TOWNSHIP
NORTHWESTERN QUEBEC
NTS 32E/9

Ministère de l'Énergie et des Ressources
Service de la Géointormation
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A.E. Heagy, P.Geol.
January 15, 1986
Geotest Project: 60-199

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## S U M M A R Y

The Casa Berardi-Joutel property owned by Geotest Corporation of Ottawa consists of 27 claims in Joutel Township of northwestern Quebec.

The property lies some 1,500 metres north of the Agnico Eagle gold mine near Joutel which has been in production since 1979. The property is also in the same geological belt as the recent gold discoveries made by INCO-Golden Knight and Teck-Golden Hope in the Casa Berardi area.

A comprehensive study of the geology of the Geotest property was carried out using information available in assessment reports and government publications. The as yet unpublished results of the detailed government geological mapping in the area in 1985 were integrated in the compilation.

The Geotest property includes several geologically favourable horizons which should be thoroughly explored for gold using geophysical, geochemical and geological techniques.

## I. INTRODUCTION

A compilation of available geological data was recommended as part of a preliminary exploration program for Geotest Corporation's Casa Berardi-Joutel region property. Geological information obtained from assessment reports by previous operators on claims on and adjacent to the ground presently held by Geotest has been integrated with recent 1:20,000 scale mapping by Quebec government geologists.

GEOTEST CORPORATION acquired the Casa Berardi-Joutel region property in December 1985. The 27 claim property is located in Joutel Township in the eastern part of the Casa Berardi geological belt in northwestern Quebec. This area is presently the focus of intense gold exploration activities following very successful results from exploration programs by INCO-Golden Knight , Teck-Golden Hope and Agnico-Eagle. The Geotest property is some 1,500 metres north of the Agnico-Eagle gold mine at Joutel.

The exploration program for the property was prepared by J. Hansen of Geotest Corporation in December 1985. Phase I of the recommended exploration program includes line cutting and magnetometer and VLF geophysical surveys in addition to the geological compilation work. Phase 2 of the program calls for drill testing of geophysical and geological targets outlined by the initial work.

Data examined in preparing the geological compilation includes:

1) Assessment reports of previous work on claims within a one-mile radius of the Geotest Casa-Berardi-Joutel property. These reports are on file with the Quebec Ministère de l'Energie et des Ressources offices in Noranda and Quebec City. A list of reports examined is

included in the bibliography.

2) Government geoscience publications including the geoscientific compilation maps, recently released 1:50,000 geology maps of the Harricana-Grasset region, and a 1:20,000 geological map by S. Lacroix in 1985 which is available for viewing at the MER office in Noranda and will be published later this year.

## II. PROPERTY

The property consists of 27 unpatented mining claims located in Joutel Township. The total surface area is approximately 424 hectares.

The claim numbers and the anniversary dates are shown on TABLE I on the attached page. FIGURES 1 and 2 show the location of the Geotest property with respect to adjacent properties and adjacent claims.

## III. OWNERSHIP

The claims are jointly owned by J.E. Hansen and C. Salamis.

## IV. LOCATION AND ACCESS

There is no direct road access to the claims but they are readily reached from Joutel via the paved access road to the Agnico-Eagle mine site. At the mine site there is access to the Harricana River and the claims can be reached by

travelling approximately 1,500 metres along the river by snowmobile in the winter or by boat in the summer. The river provides good access for drilling equipment during the winter months when it is frozen.

The town of Joutel is the townsite and service centre for the adjacent Agnico-Eagle gold mine and the Selbaie base metal mine some 80 kilometres to the west.

Joutel is approximately 200 kilometres by paved road, north of Val d'Or. The closest rail head is Matagami approximately 70 kilometres to the east.

TABLE I

COMPANY Geotest Corporation Project: 60-184D

OWNER -27 claims-

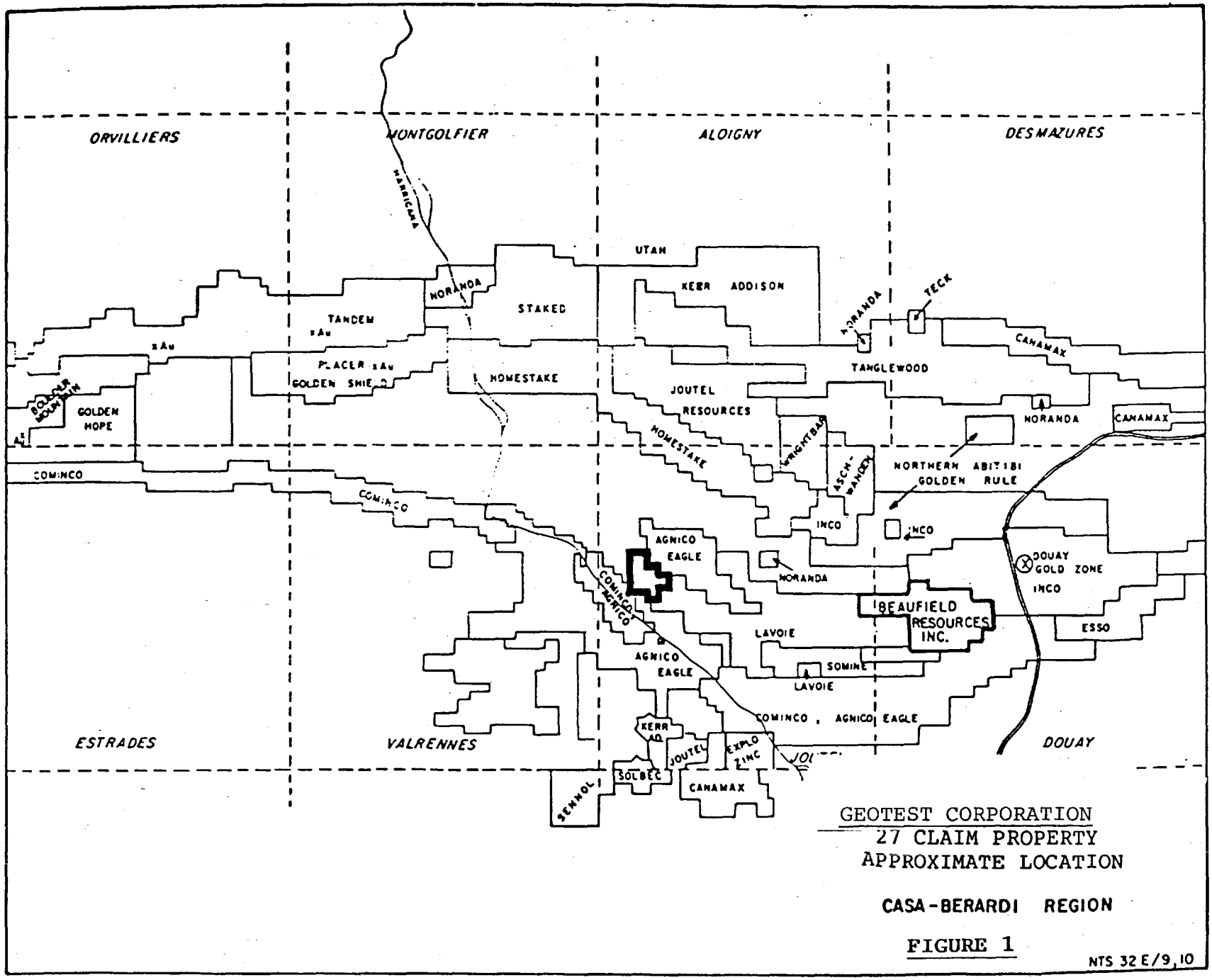
AREA JOUTEL TOWNSHIP, QUEBEC

NTS.

DATE December 6, 1985

| | PERMIT | CLAIM | RANGE | LOT | HECTARES | ANNIVERSARY DATE | WORK SURPLUS FROM PREVIOUS ANNIVERSAR |
|---|---|---|---|---|---|---|---|
| 1. | 431803 | 1,2,3,4,5 | | | (16) 80 | August 6, 1986 | |
| 2. | 431804 | 1,2,3,4,5 | | | (16) 80 | August 7, 1986 | |
| 3. | 431805 | 1,2,3 | | | (16) 48 | August 8, 1986 | |
| 4. | 431805 | 4 | | | 8 | August 8, 1986 | |
| 5. | 431805 | 5 | | | 16 | August 8, 1986 | |
| 6. | 431806 | 1 and 2 | | | (16) 32 | August 9, 1986 | |
| 7. | 431807 | 2,3,4,5 | | | (16) 64 | August 10, 1986 | |
| 8. | 431808 | 1,2,3,4,5 | | | (16) 80 | August 11, 1986 | |
| 9. | 431810 | 2 | | | 16 | August 13, 1986 | |

TOTAL: 424 hectares (Approximate area)




GEOTEST CORPORATION

27 CLAIM PROPERTY

APPROXIMATE LOCATION

CASA-BERARDI REGION

FIGURE 1

NTS 32 E/9,10

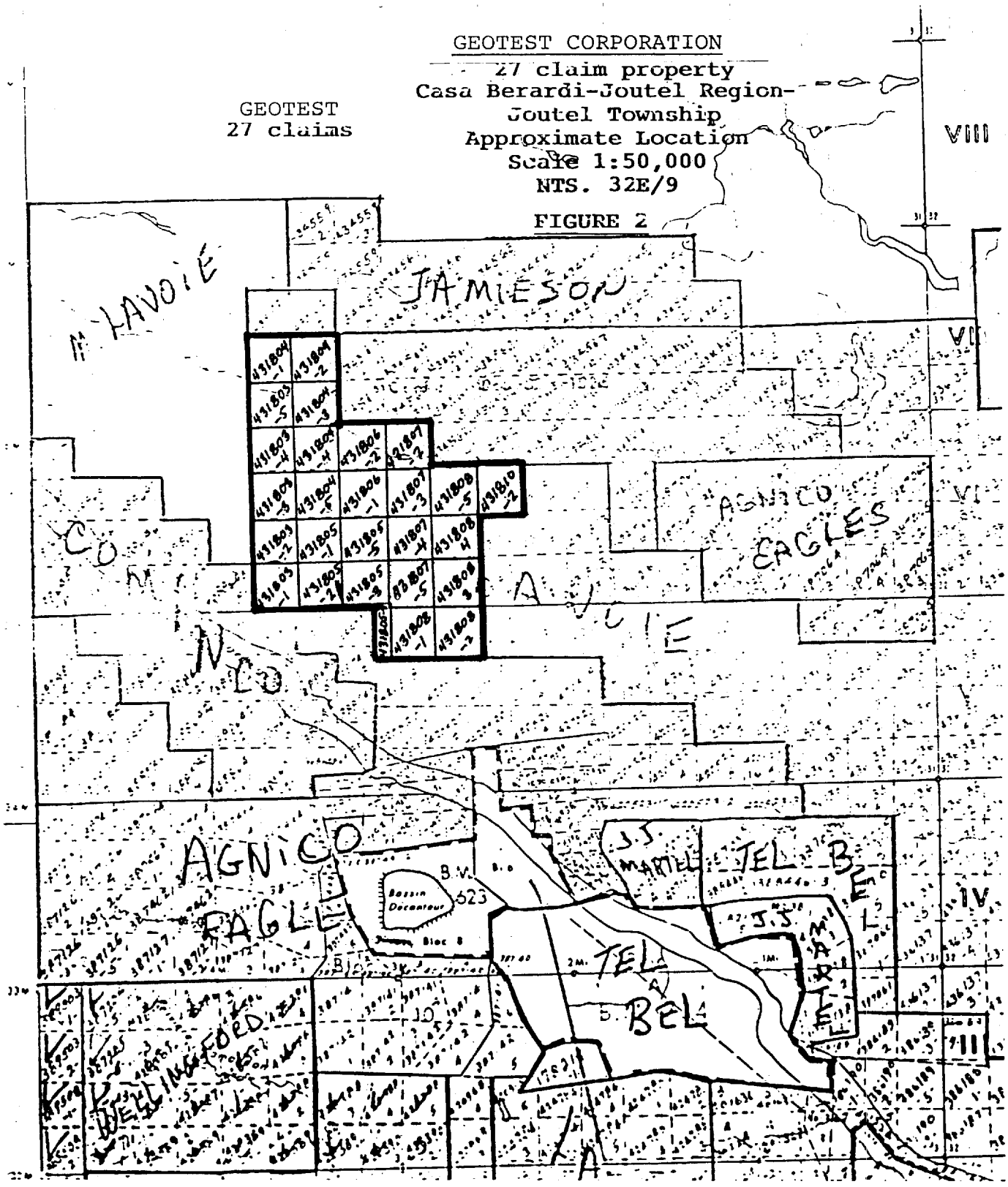
SCALE 1:250,000

0 5 10 KM

GEOTEST CORPORATION

27 claim property
Casa Berardi-Joutel Region-
Joutel Township
Approximate Location
Scale 1:50,000
NTS. 32E/9

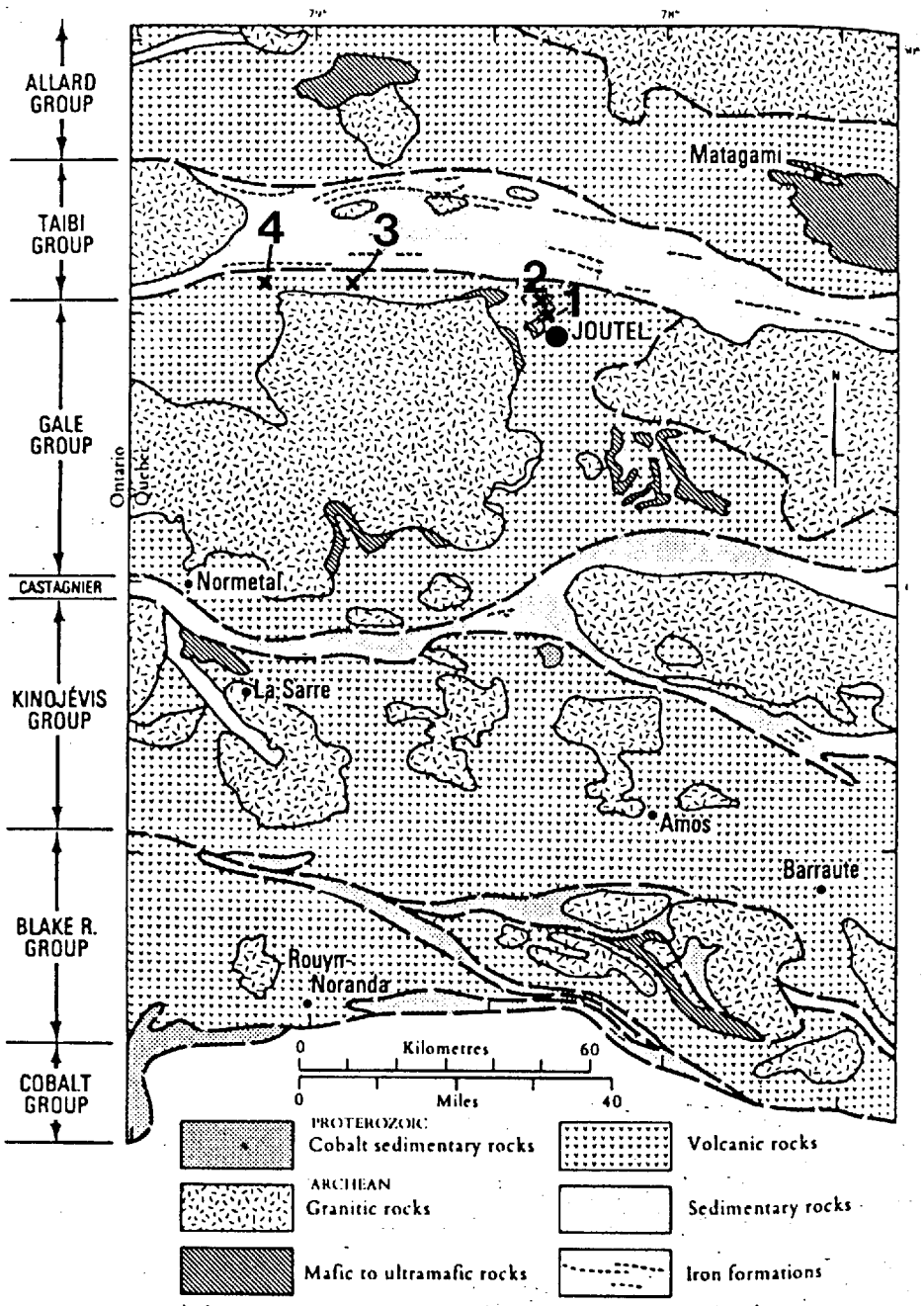
FIGURE 2



## V. REGIONAL GEOLOGY OF THE CASA BERARDI-JOUTEL REGION

The Casa Berardi-Joutel region is situated in the Abitibi subprovince of the Superior Province of the Canadian Shield. The geological mapping in this region is undergoing revision and the lithostratigraphy has not yet been integrated with the general lithostratigraphy of the Abitibi subprovince. The stratigraphy as shown in FIGURE 3, a regional geology map, is based on a 1976 compilation by Latulippe which places the Archean volcanic-sedimentary rocks of the Casa Berardi-Joutel belt in the Gale Group.

The Casa Berardi-Joutel belt has an east-west trending synformal structure with a core of sedimentary rocks bordered by steeply-clipping to overturned predominantly mafic volcanic belts facing into the axial plane of the synform. The synformal structure is flanked by granitic batholiths. At Joutel a north-south corridor of volcanics crosses the batholiths and join the Casa Berardi-Joutel belt with a similar east-west volcanic belt running through Normetal.




(From Barnett et al, 1982)

1. Agnico-Eagle gold mine
2. Geotest property
3. Teck-Golden Hope discovery
4. INCO-Golden Knight deposit

FIGURE 3

GEOTEST CORPORATION

CASA BERARDI-JOUTEL PROPERTY

JOUTEL TOWNSHIP

REGIONAL GEOLOGY

Scale 1:5,000,000 (approx.)

## VI. LOCAL GEOLOGY OF THE GEOTEST PROPERTY AREA

FIGURE 4 depicts the simplified geology of the area of the Geotest Corporation property in northwestern Joutel Township. This figure is taken from a government geological compilation map of Harricana-Grasset region which has recently been released. This geology map was prepared by compiling numerous individual geology maps prepared by various geologists working on mineral properties in the area, and integrating government airborne geophysical survey data. In 1985, S. Lacroix, Quebec government geologist from Noranda completed detailed geological mapping in this area which indicates discrepancies in this compilation. The results of the 1985 mapping are available for viewing at the MER office in Noranda and will be published later in 1986. This newer geological mapping has been integrated into the 1:10,000 geological compilation prepared in this study and is discussed in more detail later.

The Geotest property lies on the south limb of the Casa Berardi-Joutel synformal structure. In this area the stratigraphy strikes northwesterly and dips are generally subvertical. The lithologies are predominantly volcanic with the most common lithologies being intermediate to mafic volcanics. FIGURE 4 indicates six stratigraphic intervals characterized by an assemblage of felsic to intermediate pyroclastic rocks with lesser amounts of argillite and exhalite. The horizon of this assemblage which is followed by the Harricana River hosts the Agnico-Eagle gold deposit which lies just south of the map area. A northeasterly trending diabase dyke in the southeast corner of the map also crosses the Agnico-Eagle deposit and is believed to have intruded a major fracture which acted as a conduit in the formation of the 12,000,000 ton gold deposit.

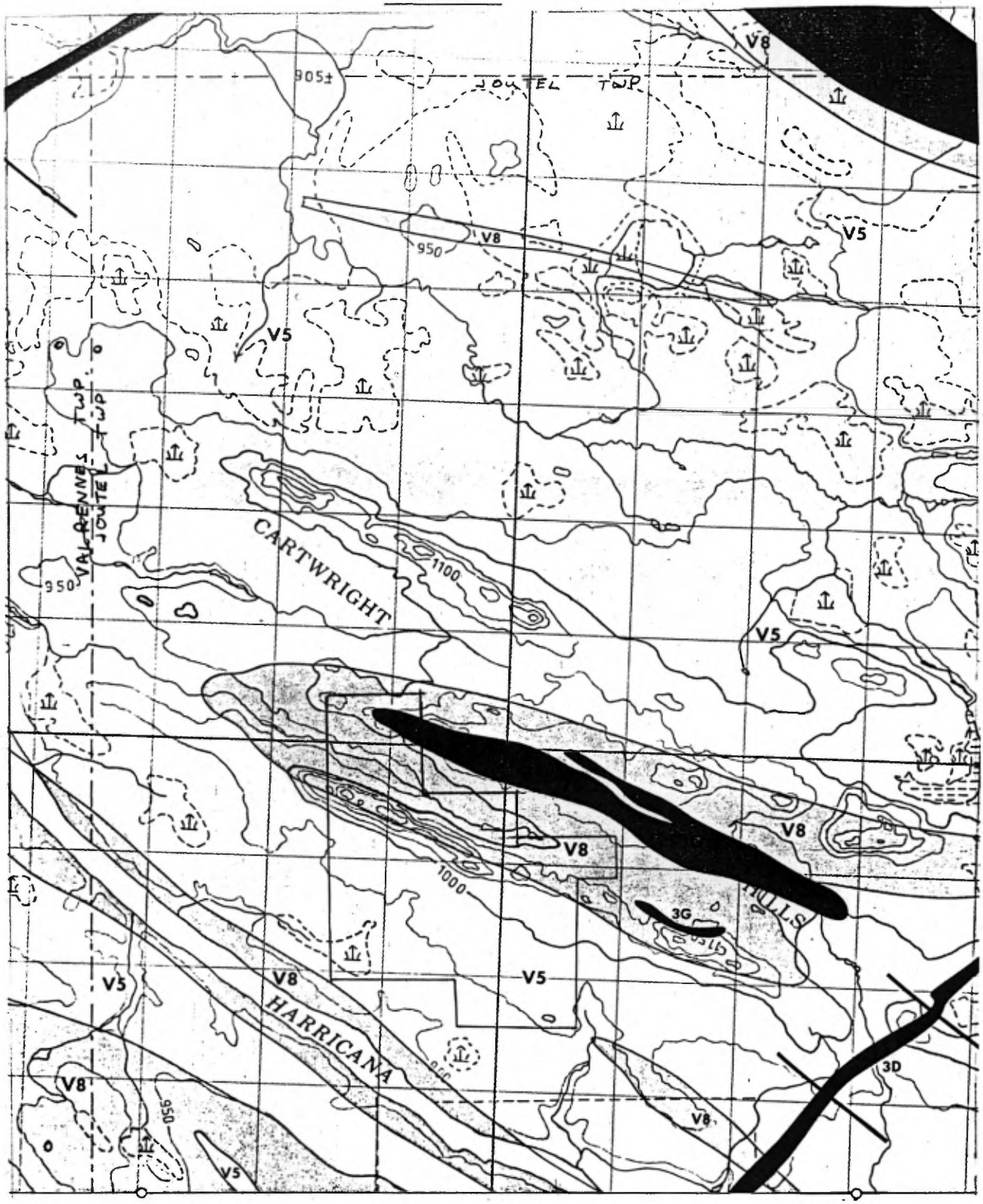
The three pyroclastic horizons in the central area of the map are shown as discontinuous lenses. In part this reflects the highly variable outcrop exposure across the map area but in part it is due to discrepancies in mapping by different geologists. Several thinner intervals of this pyroclastic-argillite-exhalite package are known but not shown at this scale.

The dark-coloured gabbroic intrusion shown to the northeast of Geotest property are gabbroic to dioritic sills which are coeval with the mafic volcanism.

Other than the diabase dyke the only indicated cross-cutting structure are two northwest trending faults shown crossing the diabase dyke. Since these faults are concordant to the stratigraphy they are difficult to recognize away from the dyke.

The former Joutel Copper Mine, 8 kilometres south of the Geotest property, was located in a shear zone with a similar northwest orientation.

FIGURE 4




V5 intermediate to mafic volcanics

V8 pyroclastics, argillite, exhalite

3G gabbro, diorite

3D diabase

GEOTEST CORPORATION

CASA BERARDI - JOUTEL PROPERTY

LOCAL GEOLOGY 1:50,000 (Map 2009 from ET-85-08)

## VII. HISTORY OF EXPLORATION IN THE CASA BERARDI-JOUTEL REGION

The Casa Berardi-Joutel region first attracted widespread exploration interest in the early 60's following the discovery of copper-zinc massive sulphide deposits at Joutel and Mattagami. The Agnico-Eagle gold mine was discovered in this period and was initially explored as a base metal prospect until its potential as a gold deposit was recognized. The mine has been in production since 1974 and some 4,000,000 tons of ore have been mined with remaining reserves estimated at 8,000,000 tons grading 0.17 oz gold per ton (5.8 g/tonne).

Although the disçovery of the major Agnico-Eagle deposit spurred some further exploration along the strike extensions of the ore-bearing horizon, no major new gold discoveries were made in the Casa Berardi - Joutel region until higher gold prices led to more extensive gold exploration efforts.

INCO and Golden Knight are presently having very good success in outlining a group of major gold deposits in Casa Berardi Township. In November 1985, drilling by Teck-Golden Hope on a weak electromagnetic anomaly in Estrees Township intersected what appears to be a significant combined gold-base metal deposit. The discovery hole returned assays of 0.20 oz/ton gold, 9.15 oz/ton silver, 2.90% copper and 15.37% zinc over a 31.5 foot intersection.

The entire Casa Berardi - Joutel belt is presently the focus of extensive exploration efforts. Considering two of the three significant gold discoveries in this belt were actually incidental to exploration of base metal targets, the potential for further discoveries of major gold deposits in the Casa Berardi-Joutel district is very high.

## VIII. GOLD MINERALIZATION IN THE CASA BERARDI - JOUTEL REGION

Since to date only one gold mine has been developed in this region, little is known of the distribution and controls on ore mineralization in this district.

The Agnico-Eagle deposit is an atypical gold deposit and shows more geological similarity to volcanogenic massive sulphide type deposits. The gold at the Agnico-Eagle mine is intimately associated with fine-grained pyrite in a sulphide-rich chemical sediment or iron formation unit. The ore horizon is underlain by felsic pyroclastic rocks and similar units as well as sediments and cherts interfinger with the ore. A graphitic schist lies stratigraphically above the ore horizon. The footwall rocks exhibit chlorite-pyrite enrichment and a similar alteration is also seen near a diabase dyke of regional extent which strikes northeasterly and crosscuts the northwesterly trending stratigraphy in the mine area.

The deposit was studied by Barnett et al (1982) who interpreted it as a volcanogenic massive sulphide deposit formed near a sea floor vent. The diabase dyke was a post-ore feature intruded into a feeder fracture zone.

The INCO-Golden Knight deposit at Casa Berardi is a more typical type of gold deposit. Although still in the early development stage it is described as a quartz vein stockwork in altered turbidites and lapilli tuffs. The ore is also closely associated with a arsenopyrite-pyrite bearing cherty exhalite suggesting some syngenetic control on mineralization. Reserves of over 6,000,000 tons grading 0.21 oz/ton (6,000,000 tonnes at 7 g/t) gold have been announced but additional reserves are indicated but not yet outlined.

The Teck-Golden Hope discovery is a massive sulphide deposit located between a volcanoclastic sediment and a quartz sericite schist. Two areas of mineralization are separated by a diabase dyke of regional extent.

The three known gold deposits in the Casa Berardi-Joutel region are all associated with chemical sediments, exhalite type units and appear to be syngenetic (or remobilized syngenetic) in origin. Two of the three deposits are intersected by diabase dykes which may be following regional fractures active at the turn of the mineralizing event.

Exploration for further deposits of this type can follow the geological guidelines used in massive sulphide exploration. Volcanoclastic, sedimentary and exhalite rocks characteristic of periods of volcanic quiescence are the favourable host rock assemblage. The possibility of intrusive-related or structurally controlled, epigenetic gold deposits, such as found in most of the major gold mining camps of the Canadian Shield, should not be overlooked.

## IX. GEOLOGICAL COMPILATION

### PURPOSE

To provide a comprehensive picture of the geology of Geotest Corporation property in Joutel Township. This model can be used to guide exploration of potential gold deposits on the claims and aid in interpreting geophysical data.

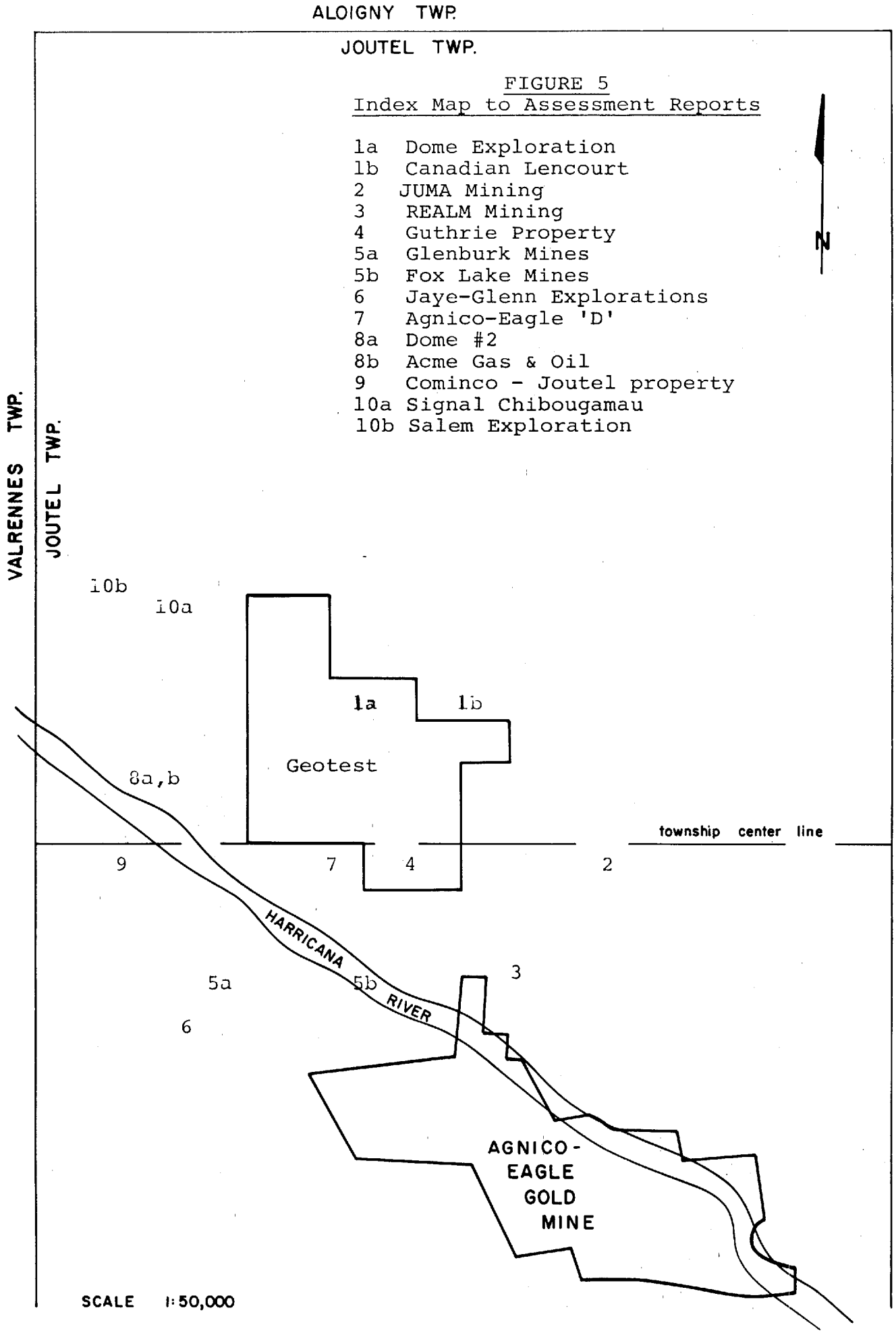
### METHOD

All assessment reports concerning work by previous operators on claims on and adjacent to the present Geotest property, as available in the government geological data files at the MER office in Noranda, Quebec, were compiled. Geological data from these reports was integrated with recent Quebec government geological publications on the area. These publications include the 1:10,000 scale geoscientific compilation maps (sheets 32E/9-101-102), a recently released 1:50,000 geological compilation map of the Harricana-Grasset area, and 1:20,000 geological mapping by S. Lacroix in the 1985 field season. This latter data is available for viewing at the MER office in Noranda but not yet published. A bibliography of assessment reports and government publications relevant to this study is included in this report.

This study includes an area within an approximately 1500 metre radius of the Geotest Corporation property boundaries bordered on the west by the Valrennes-Joutel Township line.

### PREVIOUS WORK

Assessment report records indicate the immediate area of the Geotest property has been explored intermittently since the discovery of economic base metal deposits at Joutel in the


ALOIGNY TWP.
JOUTEL TWP.
FIGURE 5
Index Map to Assessment Reports
1a Dome Exploration
1b Canadian Lencourt
2 JUMA Mining
3 REALM Mining
4 Guthrie Property
5a Glenburk Mines
5b Fox Lake Mines
6 Jaye-Glenn Explorations
7 Agnico-Eagle 'D'
8a Dome #2
8b Acme Gas & Oil
9 Cominco - Joutel property
10a Signal Chibougamau
10b Salem Exploration
N
VALRENNES TWP.
JOUTEL TWP.
10b
10a
1a
1b
Geotest
8a,b
township center line
9
7
4
2
HARRICANA RIVER
5a
5b
3
6
AGNICO-EAGLE GOLD MINE
SCALE 1:50,000

late 1950's. Although much of the exploration work was focussed on base metal targets the proximity of the major gold deposit at the Agnico-Eagle mine also prompted some gold exploration efforts, particularly along the westward, strike extension of the stratigraphic horizon which hosts the Agnico-Eagle deposit. This horizon extends across the southern part of the study area and is under active exploration by a joint venture between Cominco and Agnico-Eagle.

More than 40 assessment reports on work on claims within the study area have been filed by some 14 companies. Some of these reports deal with successive exploration programs on the same ground and the reports have been consolidated into ten groups. Resumés of the previous work and geological data on each of these ten groups have been prepared and are appended to this report. Figure 5 is an index map showing the location of the ten property groups. Table 2 summarizes the previous work programs on these groups. Copies of the assessment reports on these properties have been compiled in a separate volume which forms an addendum to this report.

Of the fourteen exploration programs examined in this study, four consisted of ground magnetic and electromagnetic geophysical surveys with no reported followup. Nine of the programs included one or more diamond drill holes. Only three report geological mapping, reflecting in part the erratic distribution of outcrops in the area.

## GEOLOGICAL MAPPING AND DRILLING BY PREVIOUS OPERATORS

The detailed geological mapping by Dome Exploration and Canadian Lencourt covered the same general area which overlaps with the northern area of the present Geotest Corporation ' property. Outcrop in this area is highly variable with very good rock exposure on the rugged ridges of the Cartwright

TABLE 2

SUMMARY OF PREVIOUS WORK IN STUDY AREA

| GROUP | COMPANY | YEARS OF WORK | WORK |
|---|---|---|---|
| 1. | a) Dome Exploration (Quebec) Ltd. - Joutel #1 property | 1961, 1962 | Magnetic and EM surveys, airborne EM, geological mapping, 7 drill holes. |
| | b) Canadian Lencourt Mines Ltd. | 1965 | Magnetic and electromagnetic surveys, geological mapping. |
| 2. | Juma Mining and Exploration Ltd. | 1964, 1965 | Magnetic and electromagnetic surveys, geological mapping, 3 drill holes. |
| 3. | Realm Mining Corporation | 1961 | Geology Report, magnetic and electromagnetic surveys, 2 drill holes. |
| 4. | Agnico-Eagle Mines Ltd. - Guthrie property | 1965-1967 | Electromagnetic survey, 1 drill hole |
| 5. | a) Glenburk Mines Ltd. | 1960-1961 | Magnetic and electromagnetic surveys, 7 drill holes |
| | b) Fox Lake Mines Ltd. | 1965 | Geology Report, 22 drill holes |
| 6. | Jaye-Glenn Explorations Ltd. | 1965 | 1 drill hole. |
| 7. | Agnico-Eagle Mines Ltd. - 'D' Group Property | 1982 | Magnetic and electromagnetic surveys In good standing. |
| 8. | a) Dome Exploration (Quebec) Ltd - Joutel #2 property | 1962 | Airborne EM Survey, ground magnetic and electromagnetic surveys. 1 drill hole |
| | b) Acme Gas and Oil Co. Ltd. | 1964, 1965 | Airborne electromagnetic survey, ground magnetic and electromagnetic surveys. |
| 9. | Cominco Ltd. - Jouval property | 1980-1982 | Magnetic and electromagnetic surveys, 11 drill holes, still under active exploration. |
| 10. | a) Signal Chibougamau Mining Corp. | 1959 | Electromagnetic survey. |
| | b) Salem Exploration Ltd. | 1965 | Electromagnetic survey. |

Hills, but little or no outcrop in the low-lying areas between the hills.

The geology as shown on the government geoscientific compilation map is taken from the mapping and drilling by Dome Exploration in 1961-62. The independent mapping done for Canadian Lencourt in 1965 generally agreed with the Dome mapping. The geology was described as a northwest-striking, northeast-facing sequence of dacitic flows and tuffs intruded by numerous gabbro, diorite and/or quartz diorite sills. The Canadian Lencourt map shows a number of thin rhyolite units which were mapped as tuffs by Dome. Table 3 correlates the legends used in this detailed geological mapping with the legends used in the recent government mapping and compilations and on Map I of this study.

Hole J-3 of the drill program by Dome in 1962 is located in the northern corner of the Geotest property. Lithologies encountered down this hole were: 59 feet of siliceous tuff with traces of pyrite, pyrrhotite chalcopyrite and sphalerite; 65.5 feet of massive and pillowed andesite flows; 12 feet of siliceous tuff with graphite, pyrite, pyrrhotite and traces of chalcopyrite; and 328.5 feet of quartz diorite. Assays from the lower siliceous tuff zone included 0.01 oz/ton gold over 7.5 feet and 0.11% copper over 2.5 feet.

Holes J-1 and J-2 of this drilling were located 500 metres east of the Geotest ground. These holes also intersected andesitic and dacitic lavas with three intervals of graphitic tuffs which contain minor copper (0.10 to 0.17%) and zinc (0.20 - 0.72%) values but negligible gold and silver.

Both the Dome and Canadian Lencourt reports suggest that the valley between the two rugged ridges at the northern edge of the Geotest ground is underlain by recessive tuffs or sediments.

The other company which prepared a geological map was Juma Mining and Exploration Ltd. The Juma mapping was limited to an area of outcrops lying approximately 1000 metres southeast of the Geotest property. This property was also drilled by Juma who completed a three hole cross-section of the area of outcrops. The geology was described as interbanded dacite flows and tuffs, meta-diorites and rhyolite rocks. The felsic rocks were of limited extent, had an anomalous southward dip and were generally chloritic, pyritic and locally sheared. A piece of gossanous pyritic rhyolite float was located but the drilling failed to locate its source.

Although the drilling did not find significant mineralization, the third hole did intersect minor rhyolite and felsic tuff and a five foot section of iron carbonate. The only anomalous gold assay was a 0.04 oz/ton value from gravelly material taken from an open fissure located immediately below the iron carbonate section in hole 3.

Regional trends indicate this band of felsic rocks should strike onto the southern part of the Geotest ground. Although it is stratigraphically above the horizon of the Agnico-Eagle deposit it should be considered a favourable target.

Mineralized float material, similar to that described by Juma, was also reported by Realm Mining Corporation which held claims to the south of the Geotest ground. This float was reported from along the Harricana River and was described as magnetic pyrrhotite-pyrite-chalcopyrite mineralized felsic material. It was thought to have been transported from a source a short distance to the north. In 1961 Realm completed two drill holes

on a magnetic anomaly located 600 metres south of the Geotest claims. These holes intersected chloritic and altered andesite and a narrow diorite dyke.

The six other diamond drill programs indicated in Table 3 were also located along the Harricana River and were testing geophysical anomalies within the stratigraphic horizon which hosts the Agnico-Eagle gold deposit. This horizon does not strike on to the Geotest property. Although this drilling does not provide additional information on the geology of the Geotest ground it does provide useful information on the geological setting of the Agnico-Eagle mine. Since this deposit is the only gold deposit in the Casa Berardi-Joutel region which has been developed and studied in detail the Agnico-Eagle deposit is the best geological model for potential gold mineralization on the Geotest property.

Cominco Ltd. presently holds the claims covering the western extension of the ore-bearing horizon and is reported to be actively exploring them in conjunction with Agnico-Eagle Mines Ltd. The assessment reports on the post-1982 work are not yet available. Diamond drilling up to 1982 indicated that the assemblage of felsic pyroclastics, argillite and chemical sedimentary rocks which host the gold deposit continue along strike to the west for at least five kilometres. Although individual beds are laterally discontinuous no general facies trends are apparent along the strike length.

In general the assays from the extensive drilling have been discouraging but more precise geochemical analysis of entire drill holes done by Cominco indicate that the chemical sedimentary units contain elevated gold values of 100 to 1400 parts per billion. The geological compilation map indicates the location of a group of six holes under the river to the south of the Geotest property which included intervals which assayed in the 1.4 to 4.8 g/tonne gold over 0.6 to 1.5 metres (0.04-0.14 oz/ton/2-5 ft). Gold and indicator element geo-

chemistry may provide a useful tool for assessing potentially mineralized horizons where exposed on the Geotest property. Indirect geochemical sampling of materials such as soils or humus may also be useful in detecting mineralized horizons which are not exposed and in assessing the significance of geophysical anomalies.

## GEOLOGICAL MAPPING BY LACROIX, 1985

Aspects of the detailed geological mapping done by S. LaCroix in the 1985 field season have been incorporated into the geological compilation map, Map I. The lithologic legend used on that map is modified from the legend used by LaCroix. Table 3 correlates the various geological legends.

There are a number of differences between LaCroix's geological map and the compilation map prepared from the assessment files (Figure 4). This is not surprising considering the latter mapping was carried out by numerous geologists working independently in small parts of the map area. However, these geologists were working at a more detailed scale than LaCroix and in some cases noted additional features.

A major finding to emerge from LaCroix's work was the recognition of ultramafic lavas exhibiting poorly formed spenifex-like textures. Only limited amounts of this rock type were noted in the study area but it forms a major lithology to the northwest.

On the bases of his mapping, LaCroix classified all of what had previously been variously called andesites, dacite, intermediate to mafic volcanics and the coeval gabbro, diorite and quartz diorite sills, as basalts. He subdivided the basalts on the basis of textural differences into massive, pillowed and porphyritic subtypes. The massive basalts include sills and possibly coarse-grained flows as well.

TABLE 3
CORRELATION OF LITHOLOGIC LEGENDS

| Heagy 1986 | Lacroix 1985 | 1:50,000 compilation (ET-85-08) | 1:10,000 geoscientific compilation | DOME 1962 | CANADIAN LENCOURT 1965 | JUMA 1962 |
|---|---|---|---|---|---|---|
| PD | Proterozoic diabase | 3D | 3D | - | - | Diabase |
| Bm | Massive basalt gabbro | 3G | 3G, 2D 2T | gabbro diorite quartz diorite | gabbro | meta-diorite |
| Bp | Pillow Basalt | ) | ) | | | |
| Bx | Basalt with plagioclase phenocrysts | ) V5 | ) V4, V5, | dacite andesite | dacite | dacite andesite |
| Um | Ultramafic lava | ) | ) V6, V7 | | | |
| Tx | Intermediate pyroclastics- crystals | ) | ) V8, V9 | tuff | rhyolite | rhyolite tuff |
| Ts | Intermediate pyroclastics- cherty to felsic | ) V8 | ) V10 | | | |
| Tf | Felsic pyroclastics- lapilli blocks | ) | ) S2, V2 ) M1 | | | |

The other major group of lithologies recognized by LaCroix were a wide range of pyroclastic units ranging from mafic to felsic in composition and cherty to lapilli or blocky tuffs. The distribution of outcrops indicate these units are thin recessive-weathering units located at several stratigraphic levels within the mafic volcanic succession.

LaCroix's map indicates he did examine several areas of outcrop on the Geotest ground. In the north area of the property the ridges mapped by Dome and Canadian Lencourt are shown as interlayered massive basalt (gabbro) and pillow basalts. One outcrop of porphyritic basalt and a few small outcrops of ultramafic lavas were also located in this area and are indicated on Map I. Of possible significance for gold exploration are three thin units of cherty intermediate to felsic pyroclastic rock indicated on the north edge of the Geotest property. These units correspond to the tuff/rhyolite unit mapped by Dome/Canadian Lencourt. The presence of these exposed pyroclastic rocks strengthens the probability of the low-lying ground being underlain by similar lithologies.

LaCroix also located a few outcrops of pillowed basalt in the southern part of the Geotest property but a stratigraphic thickness of some 500 metres with no known outcrops crosses the central area of the property.

## GEOLOGY OF THE GEOTEST PROPERTY

Outcrop on the Geotest Corporation property varies from very good on the ridges in the northern part of the property to very poor in the overburden covered southern area. The property covers a northeast-facing volcanic succession which strikes northwest and dips steeply to the north to overturned to the south. Approximately 2500 metres of stratigraphy cross the area encompassed by the Geotest claims.

The oldest stratigraphy, in the southern part of the claims, is not well exposed but small outcrops of pillowed basalts are known. An ultramafic flow outcrops near the southwest corner of the property. Altered pyritic rhyolite and felsic tuff and an iron carbonate formation were noted by Juma Mining and Exploration in 1965 in an area some 1000 metres southeast of the Geotest property. This felsic unit may strike across the southern part of the Geotest ground but is not exposed.

A 500 metre stratigraphic thickness which underlies the central part of the property is not known to outcrop.

Two rugged ridges of the Cartwright Hills cross the northern part of the Geotest property. Outcrops on these ridges expose interlayered massive and pillowed basalts. The massive units are at least in part intrusive sills which are thought to be coeval with the mafic volcanism. A few minor porphyritic basalt and ultramafic flows are also present in this area. Three thin beds of cherty felsic to intermediate pyroclastic rocks have been mapped within the basalts near the northern boundary of the property. The middle of the three beds may be the thicker of two intervals of siliceous tuff intersected in a drill hole by Dome Exploration (Quebec) Ltd. in 1962 in what is now the northern most part of the Geotest claims. The thinner tuff interval was weakly mineralized with graphite, pyrite, pyrrhotite and chalcopyrite and assayed 0.01 oz Au/ton over 7.5 feet.

It seems probable that additional horizons of the recessive weathering pyroclastic rocks are present in some of the overburden covered areas such as the valley between the two prominent ridges.

Felsic pyroclastics are part of the lithologic assemblage

associated with the gold deposit at the Agnico-Eagle mine. They are also considered a favourable guide to massive sulphide deposits. While silicified or pyritic zones within the pyroclastic rocks may contain economic gold mineralization the focus of the exploration effort should be on the exhalite formations which are associated with the periods of volcanic quiesence which are indicated by the pyroclastic horizons. The gold mineralization at both the Agnico-Eagle mine and the Teck-Golden Hope discovery is localized within the sulphide facies of an exhalite. Conductive sulphide and graphite mineralization associated with exhalites or accessory sedimentary rocks provide geophysical targets in areas with no outcrop. Soil or humus geochemistry may also be useful in detecting buried auriferous exhalites.

A north-trending linear magnetic low, visible on the regional airborne magnetics map, lies near the eastern edge of the Geotest ground and shows some topographic expression. Although the cause of this feature is not apparent, it trends towards the Agnico-Eagle deposit and may have some bearing on the geology and mineralization of the Geotest property and should be investigated further.

## X. CONCLUSIONS

1. The Geotest Corporation property in Joutel Township is located in the same geological belt which hosts significant gold and gold-bearing base metal massive sulphide deposits.

2. Features of the three known gold deposits in this belt indicate they are atypical of gold deposits in the Abitibi subprovince and show a stronger affinity with the volcanogenic base metal massive sulphide deposit models.

3. The fact that two of the three known gold deposits in the Casa Berardi-Joutel belt were discovered while exploring base metal prospects suggests the area has an untapped potential for further gold deposits less directly related to base metal deposits.

4. The geology of the Geotest property consists of a northwest striking volcanic succession dominated by massive and pillow basalts with lesser porphyritic basalt and ultramafic lavas. Three or more horizons of a pyroclastic-argillite-exhalite assemblage, similar to that which hosts the Agnico-Eagle gold deposit, strike across the property. The single drill hole on the property intersected anomalous gold values within one of these horizons.

5. Compilation of the geology and previous work on the Geotest property indicates the potential for stratabound gold deposits has not been evaluated and merits detailed exploration using updated geophysical, geochemical and geological techniques.

Respectfully submitted,

for A.E. Heagy, P.Geol.

January 15, 1986

## XI. RECOMMENDATIONS

1. Exploration of the Geotest Corporation property should concentrate on the geologically favourable horizons indicated on the geological compilation map.

2. Since little outcrop is present in these areas, geophysical surveys provide the most effective means of exploring the claims.

3. The cost effectiveness of soil or humus geochemical sampling in the areas of interest should be evaluated. The depth and nature of the overburden is of critical importance in this type of survey. An orientation survey near the site of the Dome drill hole is suggested.

4. A thorough search for outcrop in the southern and central regions of the claims should be made. Geological mapping in the northern area should concentrate on determining the paleotopography and locate any alteration zoning patterns.

5. Geophysical conductors in areas of favourable geology should be tested by diamond drilling.

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# APPENDIX

Resumés of previous work and
geology on properties on or adjacent
to the

GEOTEST CORPORATION
Casa Beradi - Joutel Property

## 1. DOME EXPLORATION, #1 PROPERTY AND CANADIAN LENCOURT MINES LTD

In 1961, Dome Exploration (Quebec) Ltd. carried out ground electromagnetic and magnetic surveys and geological mapping (GM-11539) over an area which includes much of the north-eastern area of the present Geotest property in Joutel Township. In early 1962 an airborne electromagnetic survey was flown over the north half of Joutel Township (GM-12038) and the ground geophysics was extended to the east and north-west of the 1961 work (GM-15833). Dome drilled seven holes on conductors indicated by the above surveys.

Hole J-3 of this drilling is shown as being located in the northwestern corner of the Geotest property. Holes J-1 and J-2 were located about 500 metres northeast of the Geotest ground and the other four holes were some 2000 metres farther east. Although this drilling intersected weak base metal mineralization no further work was done by Dome.

In 1965, Canadian Lencourt Mines Ltd. acquired the western part of the Dome ground and carried out another program of ground geophysics and geological mapping (GM-16609, 16610). Although they located the drill core from the Dome drilling, Canadian Lencourt did not have access to the results of the previous work.

The geophysical surveys failed to indicate any massive sulphide targets and although the ground's potential for gold deposits was not eliminated, no further work was done on the claims.

### Geology

Both Dome and Canadian Lencourt prepared detailed geological maps of the areas of the property with abundant outcrop.

The Dome mapping is shown on the government geoscientific map. The Canadian Lencourt mapping generally agrees with the Dome map.

The geology is indicated as dacite flows and tuffs intruded by numerous diorite to gabbroic sills. The Canadian Lencourt map shows a number of rhyolite bands which correspond to tuffs on the Dome map. This area is part of the 1:20,000 geological mapping done by S. LaCroix (Quebec Government Geologist at Rouyn) and the geology shown on the compilation map (MAP 1) combines aspects of all three geological maps.

The drill hole by Dome in the northern area of the present Geotest property, hole J-3 intersected: 59 feet of silicious tuff with traces of pyrite, pyrrhotite, chalcopyrite and sphalerite; 65.5 feet of massive and pillowed andesite; 12 feet of siliceous tuff with graphite, pyrite, pyrrhotite and traces of chalcopyrite; 328.5 feet of quartz diorite. Assays from the lower siliceous tuff zone included 0.01 oz/ton gold over 7.5 feet and 0.11% Cu over 2.5 feet.

Holes J-1 and J-2 are located to the east of the Geotest ground. These holes consisted largely of andesite to dactic lavas with three intervals of graphitic tuffs with minor copper (0.10 - 0.17%) and zinc (0.20-0.72%) mineralization.

Both the Dome and Canadian Lencourt reports suggest that the valley between the two rugged ridges is occupied by recessive tuffs or sediments.

From the previous work it is apparent that several horizons of tuffaceous rocks, two of which are known to contain graphite and minor sulphide mineralization, cross the north part of

the Geotest property and are favourable gold exploration targets.

## 2. JUMA MINING AND EXPLORATION LTD.

The Juma claims were located to the southeast of the present Geotest property. In 1964, Juma carried out magnetic and electromagnetic surveys of the claims (GM-15660, 15661) as well as limited geological mapping and spot soil geochemistry (GM-16106). The 1964 program was directed towards base metal deposits and though the 1964 work was largely negative the geological affinity of the property with the Agnico Eagle deposit was recognized and the gold potential of the claims was re-evaluated.

In 1965 an EM Gun electromagnetic survey was carried out (GM-17058) and a three hole cross section was drilled in an area approximately one kilometre southeast (GM-17043). The drilling failed to intersect economic gold or base metal mineralization and no further work was done.

### Geology

Outcrops on the Juma ground are restricted to a small area some 1000 metres to the southeast of the Geotest property. This area was also the locale of the three hole drilled cross-section. The magnetic survey indicate a northeast trending diabase dyke on the extreme eastern part of the Juma ground and also suggested the presence of two northwest trending strike faults (this area is outside of the compilation area but is shown on the local geology map, FIGURE 4).

The geology of the property was described as interbanded dacite flows and tuffs metadiorites and rhyolitic rocks. The felsic rocks were described as chloritic, pyritic and locally sheared and had an anomalous south dip. A piece of gossanous pyritic rhyolite float was noted and the first drill hole was drilled to test the source of the float. Holes 1 and 2 intersected

dacite, dacitic tuff and diorite. Hole 3 also intersected minor rhyolite, felsic tuff and a 5 foot section of iron carbonate. The only anomalous gold assays of 0.04 oz/ton came from gravelly material in an open fissure in hole 3 below the iron carbonate section.

The felsic volcanism described on the Juma ground appears to be stratigraphically above the horizon of the Agnico-Eagle deposit. The strike extension of the zone is not exposed. LaCroix's 1985 mapping indicated the outcrops mapped by Juma to be massive and pillowed basalts. It seems more likely that the government geological traverse missed the pyritic felsic rock unit found in the detailed work by Juma rather than an initial misinterpretation of a mafic tuff as a rhyolite.

## 3. REALM MINING CORPORATION

Realm Mining Corporation staked the ground between the present Geotest property and Agnico-Eagle mine in 1961 following the discovery of the Joutel Copper mine. The claims covered a magnetic anomaly indicated by an airborne survey by the GSC. Magnetic pyrite-chalcopyrite mineralized float had been located along the Harricana River to the south and it was thought the source of this mineralization might be on the Realm ground.

The magnetic anomaly was located by a ground survey and an electromagnetic survey was also completed (GM-11610, 11611). Two holes were drilled on the anomaly as shown on the compilation map (MAP I in pocket) (GM-12903).

### Geology

There is no record of any geological mapping or prospecting. The drill holes intersected andesite with chloritized and altered sections. A narrow (3 to 5 foot) diorite dyke was intersected in both holes. The source of the mineralized float along the Harricana River was not located.

## 4. AGNICO-EAGLE MINES LTD - GUTHRIE PROPERTY

The Guthrie property was held by the predecessors of Agnico Eagle Mines Ltd between 1965 and 1967. It included much of what is now the southern portion of the Geotest property.

Work conducted on the claims in 1967 was limited to a ground electromagnetic survey (GM-20150) and a single follow-up drill hole (GM-20151) on the north shore of the Harricana River just outside the southwest corner of the Geotest property. The geoscientific compilation map indicates some geological mapping in the southeast corner of the Geotest ground but the source of this data was not located.

### Geology

Reports indicate that very little outcrop is present in the area other than small outcrops of basalt in the eastern part of the property. A large outcrop area of cross-folded rhyolitic rocks is present on the Juma property to the east and these rhyolites were thought to strike across the Guthrie ground. This horizon is not on strike with the Agnico-Eagle mine horizon but is a similar lithologic assemblage higher in the stratigraphy.

The single drill hole was drilled into the Agnico-Eagle horizon which trends along the Harricana River. It encountered the same lithologics as overlie the ore at the mine with andesites overlying graphitic schists with cherty and sericitic intervals and minor pyrrhotite mineralization. A diorite dyke has intruded a possible fault along the northwest-trending contact of the incompetent schists with the volcanic rocks to the north. No assays were reported from this hole and Agnico-Eagle dropped this property to concentrate on developing what became the gold mine of Joutel.

## 5. GLENBURK MINES LTD AND FOX LAKE MINES LTD.

The former Glenburk Mines property was situated to the south of the Geotest property and straddled the Harricana River. The claims probably overlapped with the Geotest ground but work was focussed in the southwest area of the Glenburk property.

Glenburk Mines optioned these claims in 1960 to explore their massive sulphide potential. In 1961 magnetic and electromagnetic surveys were carried out over the entire claim block (GM-11549). Seven holes were drilled on conductors located in the southwest corner of the claims (GM-11628, 2526, 13057). No base metal sulphides were encountered and Glenburk Mines did no further work.

In 1965 Fox Lake Mines optioned the northeast 20 claims of the Glenburk property which cover the same stratigraphy which hosts the Agnico-Eagle gold deposit which was first recognized as a significant gold deposit at this time (GM-16057). Fox Lake completed some 22 drill holes in 1965 and 1966 to test conductive structures outlined by the Glenburk geophysical surveys (GM-16948, 18468).

### Geology

The Glenburk exploration was directed towards massive sulphide targets in the southwestern part of the claim block. The geology as recognized in the seven drill holes consists of a repeated succession of bedded tuff, carbonaceous chert, dacite, andesite and a chloritic unit. Holes 1, 6 and 7 intersected a zone of quartz with disseminated and stringer pyrite which reportedly contained traces of gold although the assays are not given.

When Fox Lake Mines optioned the property they concentrated their drilling along the westward extension of the Agnico-Eagle gold deposit horizon. Although the highest assay from the twenty two drill holes was only 0.14 oz/ton over 4.3 feet (3.9 g/tonne over 1.3 metres), the geological setting of this mineralization is very favourable and is discussed in more detail under the Cominco-Jouval property which presently covers this ground.

## 6. JAYE-GLENN EXPLORATIONS LTD.

This company held 6 claims immediately south of the Glenburk Mines/Fox Lake Mines property. In 1965 they completed one diamond drill hole (GM-16823).

### Geology

The drill hole intersected altered rhyolites with quartz and pyrite veining. Three samples returned negligible gold assays.

## 7. AGNICO-EAGLE 'D' GROUP PROPERTY

The Agnico-Eagle 'D' property consists of a group of three claims which are adjacent to the southern boundary of the Geotest property. In 1982 magnetic and electromagnetic surveys were completed (GM-30393, GM-40300). No magnetic or electromagnetic anomalies were detected and although an IP survey was suggested no further work has been reported.

### Geology

The geophysical reports indicate that no outcrops are present on the group. Drill hole #9 by Fox Lake Mines Ltd. was drilled onto the 'D' group ground and intersected andesite and dacite with no visible mineralization.

## 8. DOME EXPLORATION #2 PROPERTY, 1962 AND ACME GAS AND OIL CO. LTD. PROPERTY, 1965

These properties were located to the west of the present Geotest property. The ground was part of the area covered by a helicopter borne electromagnetic survey of the north-western quadrant of Joutel Township carried out by Dome Exploration (Quebec) Ltd. in 1962 (GM-12038). Dome carried out ground electromagnetic and magnetic surveys to follow up on airborne conductors indicated along the Harricana River in the southwest corner of their survey area and then staked the ground (GM-15772).

In 1962, Dome drilled a test hole into one of the conductive structures and encountered graphite and talc schists. One section assayed 0.21% Cu and 0.02 oz/ton gold over 3.3 feet. No further work was done by Dome.

In 1964 an airborne EM survey was flown over the vicinity of the former Dome #2 property for B. Lang (GM-15664). By 1965 Acme Gas and Oil Co. Ltd had acquired the ground and also carried out ground magnetic and electromagnetic surveys (GM-16826). Although one drill hole was proposed no record of further work was found.

### Geology

The reports of work carried out by Dome and Acme concentrate on the geophysical surveys and provide little geological data. The conductors were considered to be graphitic units on the basis of their geophysical character. This was apparently confirmed in a test drill hole by Dome but no record of the drilling was located. A magnetic feature on the northshore of the river was attributed to a basic intrusion.

The trend of both the conductive and magnetic zones parallel the north-west course of the Harricana River and thus lie to the south of the Geotest property. The portions of the former properties on geological strike with the Geotest claims were not covered by the ground geophysical surveys. No airborne anomalies were indicated.

## 9. COMINCO-JOUVAL PROPERTY

Cominco holds a large block of claims, known as the Jouval property, which cover the western strike extension of the Agnico-Eagle ore horizon which follows the course of the Harricana River. This property includes ground held in the former Glenburk and Fox Lake property and the Dome #2 and Acme properties.

In 1980 Cominco carried out detailed magnetic and electromagnetic surveys (GM-37117). In 1981 they completed ten widely spaced drill holes (GM-37609). An additional hole was drilled in 1982 (GM-39701). The property is now being explored in a joint venture arrangement with Agnico-Eagle Mines Ltd.

### Geology

The property covers the northwest-striking lithologic unit which hosts the Agnico-Eagle gold mine to the southeast. This critical horizon is up to 400 metres thick and includes felsic pyroclastic and volcaniclastic rocks with interbedded argillites and exhalitive units. The chemical sediments include cherts, graphitic cherts and iron carbonate and sulphide formations. The underlying stratigraphy to the southwest includes rhyolites and tuffs. The stratigraphy to the northeast includes andesitic and basaltic volcanics but is not well exposed and has been tested by only a few drill holes. As at the Agnico-Eagle mine, a magnetic diorite dyke is present along the contact between graphitic schists at the top of the ore-bearing lithologic assemblage and the overlying intermediate volcanic sequence.

A regional fault has been postulated along this contact zone but is difficult to prove given the incompetence of the graphitic schists.

Drilling to date has intersected minor gold mineralization, generally in the range of 1 to 2.4 g/tonne Au over a few metres, but no ore has been outlined.

Because of its continuity with the known gold deposit this horizon is considered to have a very high potential for hosting additional deposits. However similar lithologic assemblages are present at intervals higher in the regional stratigraphy and also form favourable targets. At least one and likely two or three such horizons cross the Geotest property.

## 10. SIGNAL CHIBOUGAMAU MINING CORP AND SALEM EXPLORATION LTD.

This ground is located to the west of the Geotest property, near the Joutel-Valrennes Township boundary. An electromagnetic survey was carried out on the claims by Signal Chibougamau Mining Corp in 1959 (GM-8901). Although geological mapping and 1500 feet of diamond drilling is recommended no further work by this company is reported.

Salem Exploration Ltd later acquired this ground and in 1965 carried out an electromagnetic survey (GM-17045) to locate two conductors indicated in the Signal Chibougamau survey. They were not able to relocate the anomalies and did no further work.

### Geology

The Salem report indicates that outcrops are present in the northeastern area of these claims but no geological mapping was completed.